

# **Bayini, Macassans, Balanda, and Bininj: Defining the Indigenous past of Arnhem Land through Culture Contact**

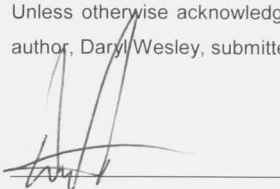
**Daryl Lloyd Wesley**

**22 AUGUST 2014**

A thesis submitted for the degree of Doctor of Philosophy  
of The Australian National University.



Unless otherwise acknowledged in the text, this thesis represents the original research of the author, Daryl Wesley, submitted in August 2014 for the degree of Doctor of Philosophy.

A handwritten signature in black ink, appearing to read 'Daryl Wesley', is written over a horizontal line.

Daryl Wesley





## ACKNOWLEDGMENTS

The research was funded by the Australian Research Council-funded project 'Baijini, Macassans, Balanda, and Bininj: Defining the Indigenous Past of Arnhem Land through Culture Contact' (LP0882985) with Professor Sue O'Connor (Chief Investigator) with contributions from the Linkage Partners Director Mr Stephen Sutton, Bushfires Council NT and the Director Mr Brian Prince, Department of Sustainability, Environment, Heritage and Water. Fieldwork was also funded by the George Chaloupka Fellowship from the Museum and Art Gallery of the Northern Territory, kindly sponsored by Energy Resources of Australia Ltd.-Rio Tinto.

I would like to thank Traditional Owners Ronald Lamilami and his family for their support, guidance and enthusiasm throughout fieldwork from 2008 to 2010. Traditional Owners Charlie Mangulda, Ronald Lamilami, Mark Mangiru, Donny Namundja and Jacob Nayingul (dec.), the Nayingul family and Manilagarr Traditional Owners for their support, guidance and enthusiasm throughout fieldwork, for their permission to undertake the fieldwork and for the use of their cultural heritage in the research of this PhD.

I would like to acknowledge my supervisory panel, Professor Sue O'Connor, Dr Sally Brockwell and Dr Jack Fenner for their support during this research and especially their assistance after my accident to complete my thesis. The Australian National University, Department of Archaeology and Natural History staff who have contributed to various aspects of this thesis include Dr Janelle Stephenson, Dr Ulli Proske, Professor Geoff Clark and Dr Christian Reepmeyer are also worthy of acknowledgement. I would also like to acknowledge the staff of the School of Culture, History, and Language, in particular Sharon Donohue for assistance in managing the ARC Linkage project.

This research has been undertaken in collaboration with teams from The Australian National University, Griffith University and Flinders University. In a collaborative effort our project team coordinated with the ARC-funded 'Picturing change: 21st Century perspectives on recent Australian rock art', involving researchers from Griffith University (Professor Paul Taçon), The Australian National University (Dr Sally K. May), University of Western Australia (Dr Alistair Patterson). Rock art survey and recording throughout the Wellington Range was undertaken by teams from both projects including Wayne Brennan, Mel Marshall and Dr Ines Domingo Sans

Flinders University collaborators Dr Jennifer McKinnon and students assisted with excavations and magnetometer field survey and advice on maritime fishing and whaling. A component of this research has focused on aspects of the maritime archaeology. Dr Jennifer McKinnon, Jason Raupp, Toni Massey, and Kenny Keeping from Flinders University collaborated with the Archaeology and Natural History research team to investigate the Macassan trepang industry and aspects of the archaeology that involved maritime themes.

### Fieldwork

Fieldwork was facilitated by Jo-Ann Christopherson, Ian White, the Northern Land Council and the Jabiru Regional Office. Research approvals were granted through

the Northern Land Council. I would like to acknowledge the work and collaboration with Nicholas Hall, Sandy Blair, and Trent Wilkinson on developing the Naumidjbuk Estate cultural heritage management planning with the Manangowal Traditional Owners.

Field data were collected with assistance from Richard Woolfe, Jason Raupp, Ben Keys, Sally May, Ines Domingo Sans, Noel Tan, Rose O'Sullivan, Tristen Jones, Elena Piotto, Nick Mclean, Chris Chippindale, Tim Maloney, Birgit Flatow, Birgitta Stephenson, Faye Prideaux, Heidi Pitman, Meg Travers, Sam Merrill, Janet Davill, John Wilson, Toni Massey, Teresa Skellett, Dave Sampson, Fiona McKeague, Yvonne Knowland, Victoria Wade, Alandra Tasire and Wayne Brennan.

Thanks also to Michael Wells, Dianne Bensley, David Steinberg, Trish Bourke from the Heritage Conservation Branch, the Department of Natural Resources, Environment, Arts and Sport for their contribution to the project and fieldwork. The North Australia Research Unit (ANU) in Darwin supported the project with a base of operations for the fieldwork in the Northern Territory. Additional assistance in the field was kindly provided by Cameco Australia, and Richard McAllister of the Office of the Supervising Scientist, Division of the Supervising Scientist

I would like to thank Dr Jack Fenner who provided the mapping, ground penetrating radar (GPR), and global positioning system (GPS) surveys of the Anuru Bay A site; Paul Brugman assisted with the GPS and mapping in the Wellington Range; Jon and Sheila Harmon are thanked for their participation and demonstration of D-Stretch; Christian Reepmeyer for the application of portable X-ray fluorescence spectroscopy (pXRF) in the study of rock art; Tony Barham who organised The Australian National University (ARCH8002) field participants—grateful thanks to Bradley Ward, Rose Whitau, Lisa Ewenson, Bruce Brown, Tanya Erofeev, Luke Atkinson, Jakob Ruhl, Rachel Ward, Mark Walker, Jason Gatty, Rebecca McMillan, Robin McAlpine, Jasmine Robertson, Llewellyn Sibley-Punnett, Anne Macdonald Constantine, Fenja Theden-Ringl, Britney Ambrose, Samantha Cooling, Wynne Anne Van Der Walt, Nat Redman, Shelley Bonner and Cat La Puma.

I would also like to thank James Woodford and Ric Stevens for their excellent reporting of the project in the Sydney Morning Herald. Also to Emma Masters, Anna Henderson and Laetitia Lemke from the Darwin branch of the Australian Broadcasting Commission (ABC) for covering our project on Stateline/7.30 Report on three occasions to bring the aims of our research and the aspirations of the Traditional Owners to a wide audience.

## **Research and Analysis**

Thanks also due to Tim Maloney, Meg Travers, Katherine Seikel, Mirani Litster and Melissa Heatherington for laboratory sorting of materials from this project. Katherine Seikel, Tristen Jones and Mirani Litster assisted with supervision of ANU undergraduate student volunteers for sorting the excavated materials. Undergraduate students to be acknowledged for assisting with the sorting of excavated materials include Kara Schrader, Jeff Thys, Camilo Robles Guazzini, Sarah Kershaw, Maddison Morris, Rhiannon Smith, Jessica Eldridge, Christopher Wormald, Lucy Blackham, Diane Morris, Aaron Melville, Emma Church, Heidi Veltman, Huan Zheng,

Kelsie Long, Elise Horspool, Sebastian Trew, Kate French, Sarah Muller, Elle Grono, Bronwyn Heaney, Harrison Pitts, Declan Helby, Leisa Caldwell, Angelica Snowden, Charlotte Gardner, Veronica O'Brien, Elizabeth McDowell and Emma Church.

I would like to thank the team from the ANU College of Asia and the Pacific Cartography and Geographic Information Systems, in particular Jennifer Sheehan for production of maps and drawings.

I would like to thank Masters research students Tristen Jones, Jay Chin and Fenja Thedn-Ringl for undertaking specific research projects into various aspects of the archaeology and environmental history from the project. Mirani Litster and Lucy Blackham assisted with the analysis of contact artefacts from Malarrak excavations. Firearms, aircraft, and ship identification was assisted by John White from the Australian War Memorial and historical archaeologist Colin de la Rue. Jessica Viney assisted with research into rock art decorative designs and the history of the HMAS Gayundah and the HMAS Moresby.

### **Accident and Recovery**

I would like to thank Christian Reepmeyer, Tristen Jones, Bruce Brown, Natalie Langowski, the staff of Gunbalanya Health Centre, Gunbalanya NT police officers, and Careflight for their care and recovery of me to Darwin Hospital. I would like to thank the following for their assistance and help in being able to recover from my accident in 2012 and complete my thesis research: Pro Vice-Chancellor for Research Professor Jenny Corbett; Acting Director CHL Professor Bij Lal; Huma Cheema; Jo Bushby; ANU Disability Services staff Julie Harrison, Angela Savazzi and Susan Hancock; and Billy O'Foghlu and Mirani Litster as my disability assistants. The medical professionals that I would sincerely like to thank for my successful rehabilitation include Dr Keith Chan, Dr Andrew Boyden, Dr Maurizio Damiani, Dr Gawel Kulisiewicz, Dr Alexander Burns, the staff of Calvary John James Rehabilitation Ward, and the staff of PhysioSport—Laura Yammouni and Kirsty Ballon. I would especially like to thank physiotherapists Lisa White and Myles Roantree for their continual support and encouragement during my rehabilitation. I would like to include thanks to Elvi, my Swedish Vallhund Service Dog (MindDog) for company and for providing a distraction from the chronic pain during the many months of my recovery while writing my final chapters.

### **Thesis Development**

This thesis has benefited from comments and suggestions made whilst in the field, at conferences and elsewhere but in particular from Dr Chris Chippindale, 'ben' Gunn, Dr Jack Fenner, Professor Campbell Macknight, Scott Mitchell, Ian White, Stephen Sutton, Fiona McKeague, Professor Sue O'Connor, Dr Sally Brockwell, Dr Andrew McWilliam, Professor Paul Taçon, Ian White, Professor Peter Veth, Professor Peter Hiscock, Dr Ken Mulvaney, Dr Judith Cameron, Bruce Birch, Sabine Hoeng, Nicholas McClean, Katherine Siekel, and Mirani Litster.

### **Professional Editing**

The introduction to this thesis was edited by Marion Mapham of Uwriteit (ABN 55767364356) in line with the Australian Standards for Editing Practice.

## Thanks to My Wife

Lastly, but by no means least, I want to thank my wife Eva Purvis for her steadfast and resolute support during my research and for her exceptional help after my accident to assist with my recovery. Without her this thesis would never have been completed.

## Indigenous Languages

Indigenous words in this thesis are spelled according to the following orthographies largely following Evans (2003) *Bininj Gun-wok: A pan-dialectal grammar of Mayali, Kunwinjku and Kune, Volume 1*.

For the *lwaidja* language follow the <http://glottolog.org/resource/languoid/id/iwai1244> and <http://ausil.org/Dictionary/lwaidja/lexicon/mainintro.htm>; Lowe (2004) for *Yolngu Matha*; Singer (2005, 2010a, 2011b, 2012) for *Mawng*; and Harvey (1999) for *Gaagudju*.

## ABSTRACT

This study has set out to investigate unresolved issues regarding the chronology, nature, and subsequent impacts from culture contacts between South East Asian maritime communities, Europeans, and northern Australian Indigenous populations. These issues include the question of whether there is archaeological evidence for pre-Macassan visitation in north western Arnhem Land. Therefore an important aim included assessing whether it is possible to measure the level of interaction and impact the trepang industry and later European economies had on local Indigenous communities through the investigation of the archaeological record from the Wellington Ranges, coastal region of Anuru Bay, and South Goulburn Island. Within the scope of this aim, it was important to re-assess and radiocarbon date the well-known Malara (Anuru Bay A) trepang processing site in order to gain a greater understanding of the intensity and frequency of Macassan (and possibly pre-Macassan) occupation, trepang processing, and contact with Aboriginal people. The results of this study support a longer timeframe of culture contact occurring from the early to mid-17th Century with a proliferation in the Macassan trepang processing industry from the mid-1700s. The study also aimed to investigate the complexity of change in Indigenous society during the culture contact period through documentation and analysis of the Indigenous archaeological record (material culture, rock art assemblages) at the Malarrak, Djulirri, and Maliwawa rockshelter complexes in the Wellington Range. This involved an examination of the spatial distribution of Indigenous rock art and archaeological sites to assess changes in residential mobility (both local and regional), resource utilisation, and impacts on Indigenous customary trade and exchange. A particular focus of this study analysed changes in Indigenous rock art production within western Arnhem Land that occurred during the culture contact period. This archaeological evidence has also been evaluated in conjunction with historical, ethnographic, linguistic, and anthropological records. The changes that occurred in Indigenous society accompanied by culture contact have been assessed using the Indigenous hybrid economy model developed by Altman (2006). This thesis argues that the archaeological evidence (i.e. occurrence of beads, rock art paintings of firearms and ships) establishes the presence of an operating hybrid economy between Indigenous people, Europeans, and Macassans. The operation of the hybrid economy allowed for Indigenous people to negotiate and interact with others based on customary law and tradition to influence the outcomes in these exchanges, such as allowing others to be on their country and to utilise their resources (i.e. trepang, buffalo). Building on Mitchell (1994) and Clarke's (1994) models of culture contact, this study proposes that western Arnhem Land culture contact proceeds and then transforms during five significant temporal phases consisting of (a) pre-Macassan, (b) Macassan, (c) Colonial, (d) Mission, and (e) Welfare economic periods.

## CONTENTS

1.0 INTRODUCTION .....	12
1.0.1 Aims .....	12
1.0.2 Background to the Research .....	14
1.0.3 The Research Area .....	18
1.0.4 The History of Culture Contact in Arnhem Land .....	22
1.0.5 Issues in the Chronology of Culture Contact .....	28
1.0.6 Indigenous Participation in the Macassan Trepan Industry .....	35
1.0.7 Implications of Culture Contact in North Western Arnhem Land .....	40
1.0.8 Interpreting Culture Contact Archaeology.....	47
1.1 METHODOLOGY.....	55
1.1.1. Participatory Consultation and Cultural Heritage Management .....	55
1.1.2. Survey and Site Recording .....	58
1.1.3. Site Excavation and Collection .....	62
1.1.4. Lithic Assemblages.....	63
1.1.5. Stone Raw Material Identification .....	64
1.1.6. Non-stone (Contact) Artefacts .....	64
1.1.7. Shell Species Identification.....	67
1.1.8. Radiocarbon Dating.....	69
1.1.9. Rock Art.....	70
1.2. Thesis Structure.....	78
1.2.1. Chapter 2: Re-evaluating the timing of the Indonesian Trepan Industry in North West Arnhem Land: Chronological investigations at Malara (Anuru Bay A). Daryl Wesley, Sue O'Connor, Jack Fenner.....	78
1.2.2. Chapter 3. Earthenware of Anuru Bay: A Reassessment of Potsherds from a Macassan Trepan Processing Site, Arnhem Land, Australia and Implications for Macassan Trade and Trepan Industry. Daryl Wesley, Tristen Jones, Sue O'Connor, Jack Fenner and William R. Dickinson .....	80
1.2.3. Chapter 4. "Small, Individually Nondescript, and Easily Overlooked": The significance of contact beads from rockshelters in the Wellington Range, north western Arnhem Land. Daryl Wesley and Mirani Litster.....	80

1.2.4. Chapter 5. Pigment geochemistry as chronological marker: The case of lead pigment in rock art in the Urrmarning 'Red Lily Lagoon' rock art precinct, western Arnhem Land. Daryl Wesley, Tristen Jones and Christian Reepmeyer .....	81
1.2.5. Chapter 6. Sails Set in Stone: A Technological Analysis of Non-Indigenous Watercraft Rock Art Paintings in North Western Arnhem Land. Daryl Wesley, Jennifer McKinnon, and Jason T. Raupp.....	82
1.2.6. Chapter 7. Firearms in rock art of Arnhem Land, Northern Territory. Daryl Wesley .....	83
1.2.7. Chapter 8. An End to Contact Imagery in Indigenous Rock Art, Arnhem Land. Daryl Wesley .....	83
1.2.8. Chapter 9. Conclusion .....	84
 2.0. RE-EVALUATING THE TIMINGS OF THE INDONESIAN TREPANG INDUSTRY IN NORTH WEST ARNHEM LAND: CHRONOLOGICAL INVESTIGATIONS AT MALARA (ANURU BAY A).....	85
 3.0. EARTHENWARE OF ANURU BAY: A REASSESSMENT OF POTSHERDS FROM A MACASSAN TREPANG PROCESSING SITE, ARNHEM LAND, AUSTRALIA AND IMPLICATIONS FOR MACASSAN TRADE AND TREPANG INDUSTRY.....	148
 4.0. "SMALL, INDIVIDUALLY NONDESCRIPT, AND EASILY OVERLOOKED": THE SIGNIFICANCE OF CONTACT BEADS FROM ROCKSHELTERS IN THE WELLINGTON RANGE, NORTH WESTERN ARNHEM LAND. ....	187
 5.0. PIGMENT GEOCHEMISTRY AS CHRONOLOGICAL MARKER: THE CASE OF LEAD PIGMENT IN ROCK ART IN THE URRMARINING 'RED LILY LAGOON' ROCK ART PRECINCT, WESTERN ARNHEM LAND.....	239
 6.0. SAILS SET IN STONE: A TECHNOLOGICAL ANALYSIS OF NON-INDIGENOUS WATERCRAFT ROCK ART PAINTINGS IN NORTH WESTERN ARNHEM LAND.....	248
 7.0. FIREARMS IN ROCK ART OF ARNHEM LAND, NORTHERN TERRITORY.....	274
 8.0. AN END TO CONTACT IMAGERY IN INDIGENOUS ROCK ART, ARNHEM LAND....	288
 9.0. CONCLUSION.....	328
 REFERENCES.....	337
 APPENDICES.....	351

## FIGURES

FIGURE 1: MAJOR INDIGENOUS AND MACASSAN ARCHAEOLOGICAL SITES INVESTIGATED IN THIS STUDY IN THE WELLINGTON RANGE AND GOULBURN ISLAND REGION.....	14
FIGURE 2: DJULIRRI ROCKSHELTER MAIN ROCK ART PANEL IN 2006 (D. WESLEY).....	17
FIGURE 3: MALARA (ANURU BAY A) IN 2010 (LOOKING SOUTH) (D. WESLEY).....	18
FIGURE 4: STUDY AREA AND PLACES MENTIONED IN THE GENERAL TEXT (CARTOGIS). .....	19
FIGURE 5: KING RIVER ILLUSTRATING THE SINUOUS CUSPATE NATURE OF THE RIVER, EXTENSIVE MANGROVES AND SALTPANS, AND THE WELLINGTON RANGE TO THE WEST (D. WESLEY).....	20
FIGURE 6: PHOTOGRAPH BY PROFESSOR JOHN MULVANEY OF ANURU BAY (A) TRENCH ACROSS STONELINES 1 AND 2 AND A TREPANG PIT IN 1966. ....	31
FIGURE 7: HYBRID ECONOMY MODEL (ALTMAN 2007:3).....	50
FIGURE 8: PAGE 1 OF SITE RECORDING FORM USED IN THE ROCK ART SURVEY IN THE WELLINGTON RANGES. ....	60
FIGURE 9: PAGE 2 OF SITE RECORDING FORM USED IN THE ROCK ART SURVEY IN THE WELLINGTON RANGES. ....	61
FIGURE 10: EXAMPLES OF CONTACT PHASE ARTEFACTS FROM ROCKSHELTERS IN ARNHAM LAND (D. WESLEY) .....	66
FIGURE 11: EXAMPLES OF CONTACT PHASE ROCK ART (D. WESLEY). ....	77
FIGURE 13. FIVE PHASE MODEL OF ECONOMIC CULTURE CONTACT IN NORTH WESTERN ARNHAM LAND, NORTHERN TERRITORY.....	329

## TABLES

TABLE 1: PHASES OF CONTACT WITH OUTSIDERS AND THE YOLNGU (ADAPTED FROM MCINTOSH 2006). ....	23
TABLE 2: SECTORS OF THE MODERN HYBRID ECONOMY (ALTMAN 2001:5). ....	49
TABLE 3: SECTORS OF THE HYBRID ECONOMY MODEL OCCURRING IN RELATION TO THE STUDY AREA. ....	50
TABLE 4: NATURAL AND CULTURAL CHARACTERISTICS OF SHELL MIDDENS, SCATTERS AND NATURAL SHELL BEDS DIAGNOSTICS (BURKE AND SMITH 2004). ....	67
TABLE 6: CHRONOLOGICAL PERIODS ASSIGNED TO ROCK ART STYLES AFTER CHIPPENDALE AND TAÇON'S (1998:107) PROPOSED CHRONOLOGY OF ARNHAM LAND ROCK ART. ....	75



# APPENDICES

A. McKinnon, J, Wesley, D, Raupp, J T and Moffat, I 2013, 'Geophysical investigations at the Anuru Bay trepang site: A new approach to locating Macassan archaeological sites in Northern Australia'. <i>Bulletin of the Australasian Institute for Maritime Archaeology</i> , 37:106–112.....	351
B. May, S K, Taçon, P S C, Wesley, D and Pearson, M 2014, 'Painted ships on a painted Arnhem Land landscape'. <i>The Great Circle</i> , 35(2):81-100.....	359
C. May, S, Taçon, P, Wesley, D and Travers M 2010. 'Painting History: Indigenous observations and depictions of the other in NW Arnhem Land'. <i>Australian Archaeology</i> , 71:57-65.....	380
D. Taçon, P, May, S, Fallon, S, Travers M, Wesley D, and Lamilami R 2010, 'A Minimum Age for Early Depictions of Southeast Asian Praus in the Rock Art of Arnhem Land Northern Territory'. <i>Australian Archaeology</i> , 71:1-10.....	401
E. Taçon, P, Langley, M, May, S, Lamilami R, Brennan W and Guse D (Wesley), 2010, 'Ancient bird stencils discovered in Arnhem Land, Northern Territory, Australia'. <i>Antiquity</i> , 84(1):416-427.....	414
F. Theden-Ringl, F, Fenner, J, Wesley, D and Lamilami R 2011, 'Buried on Foreign Shores: Isotope Analysis of the Origin of Human Remains Recovered from a Macassan Site in Arnhem Land'. <i>Australian Archaeology</i> , 73:41-48.....	422

## 1.0 INTRODUCTION

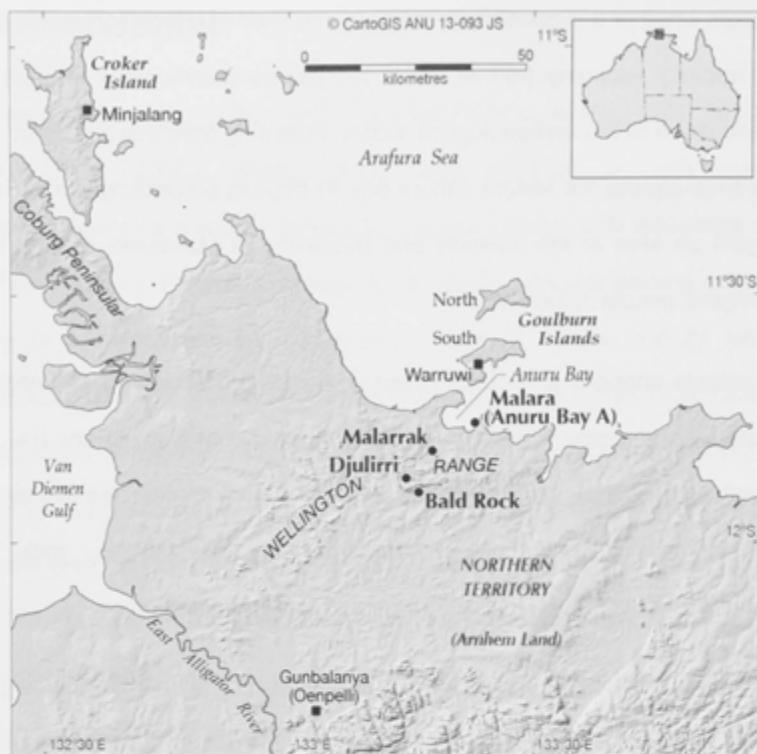
Studies by Macknight (1969, 1976), Mitchell (1994a; 1994b, 1996; 2000) and Clarke (1994; 2000a, 2000b, 2002) have provided us with important archaeological awareness of Indigenous culture contact with foreigners in the Northern Territory. Following on from these studies, the overarching aim of this thesis is to investigate the timing and nature of culture contact between Indigenous northern Australian communities and South East Asian maritime communities visiting the north western Arnhem Land coast, the impact of early English military expansion and of the later European state settlers to the region. The fieldwork focused on north western Arnhem Land which included Anuru Bay, South Goulburn Island and the nearby mainland sandstone outcrops of the Wellington Range (Figure 1). This area contains an impressive assemblage of Indigenous and Macassan archaeological sites to test chronologies and models of culture contact. Coastal areas such as Anuru Bay and South Goulburn Island were the subject of Macknight's (1969, 1976) earlier investigations of the Macassan trepang industry. The Wellington Range contains many rock art sites, including the now famous Djulirri and Malarrak contact art sites, which were previously documented by Chaloupka (Chaloupka 1974, 1993, 1996).

### 1.0.1 Aims

The aims of the project are to,

1. Investigate unresolved issues regarding the chronology and nature of culture contacts between South East Asian maritime communities and northern Australian Indigenous populations. These issues include the question of whether there is archaeological evidence for pre-Macassan visitation.

2. Assess whether it is possible to measure the level of interaction and impact the trepang economy had on local Indigenous communities through an investigation of the archaeological record. Following from this a specific aim was to re-assess the Malara (Anuru Bay A) trepang processing site in order to gain an idea of the intensity and frequency of Macassan contact with Aboriginal people in the area.
3. Investigate changes and complexities in Indigenous society of the western Arnhem Land region in relation to contact with South East Asians (i.e. the Bayini, Macassans), and Europeans, through documentation and analysis of the Indigenous archaeological record (material culture, rock art assemblages) in the Wellington Range and Anuru Bay regions.
4. Investigate the spatial patterning of Indigenous rock art and archaeological sites in the research area in order to assess changes in residential mobility (both local and regional), resource utilisation, and impacts on Indigenous customary trade and exchange (Mitchell 1994b).
5. Describe and analyse changes in the rock art corpus of western Arnhem Land that occurred during the culture contact period.



**Figure 1: Major Indigenous and Macassan archaeological sites investigated in this study in the Wellington Range and Goulburn Island region.**

### 1.0.2 Background to the Research

As McNiven and Russell (2002) state, contact archaeology has often played out as a post-colonial discourse into hidden or missing histories, rather than being aimed at understanding the dynamics of inter-cultural encounters. These inter-cultural encounters have been discussed by Macknight (1969, 1976, 1986, 2008, 2011, 2013), and especially by later researchers such as McIntosh (1996a, 1996b, 2006, 2008, 2011, 2013), Mitchell (1994a, 1994b, 1996, 2000) and Clarke (1994, 2000a, 2000b, 2002). There are currently two competing models for the chronological timings of South East Asian culture contact: the short model proposed by Macknight (2008, 2011, 2013), and the long model

proposed by McIntosh (1996a, 1996b, 2006, 2008, 2011) and Clarke (1994, 2000a, 2000b, 2002).

Macknight (1976, 2008, 2011, 2013) has discussed the issue of using the term Macassan (or Makassan) to describe the people involved in the trepang harvesting and processing industry operating out of the southern Sulawesi port of Makassar. Macknight (1976, 2008, 2011, 2013) makes the point that in lieu of a better term, 'Macassan' is probably the best collective term to describe the trepang fishermen, as although the crews originated from many islands in the South East Asian archipelago, the industry operated out of Makassar. Thus here I follow Macknight and earlier researchers in using the term Macassan specifically for the mariners who participated in the trepang industry in northern Australia. McIntosh (1996a, 2006, 2008, 2011) brings to the debate the issue of pre-Macassan visitors from Island South East Asia, also called the Baijini (or Baijini), the golden-skinned whale hunters from the north. The term Baijini is an eastern Arnhem Land Yolngu term for pre-Macassan peoples who were said to have established settlements, made cloth, and co-existed with the Yolngu (Macknight 2011). Like the term Macassan, Baijini is also probably not the most appropriate term to apply to pre-Macassan visitors to the northern Australian coastline. Terminology, like typology, presents archaeological researchers with a series of conundrums as certain approaches can be overly subjective and can contain an uncontrolled mixture of variables (Adams and Adams 2008; Bisson 2000; Hiscock 2008). The basis for choosing certain terms to describe the peoples involved in the different phases of culture contact in north western Arnhem Land will become clear later in this introduction. However, for the purposes of consistency for the reader it is important to introduce this

terminology here. For this research the following terms are used to differentiate peoples in the culture contact phases:

- *South East Asian* and *Island South East Asian* to describe peoples of pre-Macassan visitation (pre-1720), as the ethnicity or origin of any of these mariners are unknown.
- *Macassan* is used to describe the peoples involved in the trepang harvesting and processing industry who operated out of the port of Makassar post 1720.

In order to test the different models regarding the timing of South East Asian contacts in north western Arnhem Land, my archaeological research describes investigations of both Macassan and Indigenous sites from the coast through to the inland sandstone escarpment region of the Wellington Range. It also attempts to investigate the dynamics of contact, and the significance of the influence South East Asian and later European culture contact had on Aboriginal society. This analysis of the influence of culture contact is undertaken by applying the hybrid economy model developed by Altman (2001, 2003, 2005, 2006, 2009) during his assessments of the interaction of contemporary Indigenous communities with state and market economies. Therefore the scope of this research encompasses the material culture of South East Asian maritime enterprises, and the material and symbolic expressions found in Indigenous archaeological sites such as middens, rock shelters and rock art in the west Arnhem Land region.

After relocating and recording the contact rock art site Djulirri (also known as Djurlirri) in 1998 and 2006 during uranium mineral exploration fieldwork in the

Wellington Ranges for the Northern Land Council, the extent and influence of culture contact in this region became overwhelmingly apparent (Guse 1998, 1999) (Figure 2).



**Figure 2: Djulirri Rockshelter main rock art panel in 2006 (D. Wesley).**

Although the Djulirri site was reported by Chaloupka (1994, 1996) in his major rock art publications little archaeological investigation was carried out in the Wellington range prior to this project. Chaloupka (pers. comm. 2008) has put this down to the disruption caused to research by Cyclone Tracy. Another likely factor may be the time involved in establishing relationships with Indigenous Traditional Owners. In order to initiate this project on the Namunidjbuk estate discussions with the senior Mawng Traditional Owner, Ronald Lamilami, were undertaken over a period of ten years. The wealth of cultural heritage places within the estate not only included numerous Indigenous rock art complexes, but also the significant Macassan trepang processing site at Anuru Bay, Malara (Anuru Bay A) (Figure 3). It was agreed that there was some urgency to undertake research at Djulirri and the Wellington Range owing to the likelihood of future mining and development impacts in the region. Parallel to this concern was that of the Traditional Owners who wished to engage in management and enterprise development within their estate. Together Ronald Lamilami and I

worked towards developing an archaeological project that would meet these objectives, highlight the heritage significance of the region and contribute to the future aspirations for Mawng Traditional Owners.



**Figure 3: Malara (Anuru Bay A) in 2010 (looking south) (D. Wesley).**

### **1.0.3 The Research Area**

The study area is located approximately 300 kilometres east of Darwin in the north western coastal region of Arnhem Land, Northern Territory, Australia. The area includes the Goulburn Island group and the nearby coastal mainland, extending inland to the Wellington Range (Fig. 1). The primary study area is largely known as the traditional lands of Mawng-speaking Aboriginal clan groups. The Traditional Owners refer to the mainland area as the Namunidjbuk Estate. Land tenure for the research area is Aboriginal Land Trust administered under the Aboriginal Land Rights Act 1977. It is a remote locality serviced by several small communities of Waruwi and Gunbalanya consisting of less than 1,000 inhabitants (see Figure 4). The area has limited infrastructure consisting mostly of poorly constructed and maintained gravel roads and tracks.



The study area is located within the *Arnhem Coast Bioregion* which is generally dominated by coastal plains with eucalypt woodlands, monsoon vine forests and typical coastal mangrove communities (Woinarski and Baker 2002). The Arnhem Coast Bioregion is closely linked to the adjacent Arnhem Plateau Bioregion with the coastal plains environmental evolution influenced by this major geological feature (Senior and Smart 1976; Sweet et al. 1999). The Arnhem Coast Bioregion extends along a coastal strip from the base of the Cobourg Peninsula to the Rose River in south eastern Arnhem Land, and includes many offshore islands, including the Goulburn Island group. This bioregion contains some of the most remote and intact large natural systems in Australia, including extensive mangrove, seasonally-inundated floodplains, perennial swamps, coastal dune systems, monsoon rainforests and eucalypt tall open forests.



**Figure 4: Study area and places mentioned in the general text (CartoGIS).**

The region has a high degree of geomorphological complexity, and contains a diversity of environmental zones including coastal and estuarine areas, alluvial floodplains, major river systems, and sandy plains, with some areas of rugged

sandstone outcrops (Needham 1984; Senior and Smart 1976; Sweet et al. 1999). The landscape has been affected since the Pleistocene by significant sea level rise and the subsequent evolution of the major tidal river systems. Large meso-scale river systems, including the King River, combined with geological formations (such as the Wellington Ranges) gave rise to the development and location of specific micro-environments such as monsoon vine forests, sedge, grass and paperbark swamps, and freshwater springs (Figure 5).



**Figure 5: King River illustrating the sinuous cusped nature of the river, extensive mangroves and salt pans, and the Wellington Range to the west (D. Wesley).**

Geologically, the Wellington Range is the northernmost outlier of the Arnhem Land Plateau and is formed by Mamadawerre Formation (Sweet et al. 1999). This sandstone formation consists of cross-bedded quartzose sandstone varying from medium to very coarse and siliceous sandstone and is generally

found in the form of sandstone outcrops, tors, platforms and escarpment features (Senior and Smart 1976; Needham 1984; Sweet et al. 1999). The massif outliers of the Wellington Range provide the topographical setting for rock art overhangs and rockshelter habitation sites. The northernmost outlier known as Malarrak (Black Rock) is formed by the oldest portion of the Mamadawerre Sandstone Formation and consists of the polymictic pebble to boulder conglomerate. It is estimated that this sandstone was formed somewhere between 1,780 and 1,810 million years ago.

The region is considered to be floristically diverse and is known to contain over 2,000 plant taxa (Woinarski et al. 2006). The most common floral group type in the study area consists of extensive savanna woodlands and open forests dominated by eucalypts, and particularly so by two species, Darwin Stringybark *Eucalyptus tetradonta* and Darwin Woollybutt *E. Miniata* (Woinarski et al. 2002b:22). The sandstone plateau and outliers provide a refuge for plant species and the area is classed as the most significant region in north Australia for biodiversity (Woinarski et al. 2006). A study about plants known by the Aboriginal Traditional Owners of the nearby Cobourg Peninsula includes a list of names and uses for 269 plant species (Blake et al. 1998).

Arnhem Land is also notable for the diversity and abundance of its faunal species (Finlayson et al. 1988). Although there have been no specific faunal surveys conducted within the study area, it is expected that the faunal species diversity will closely reflect that of the wider Arnhem Coast and Plateau bioregions (NRETAS 2007a; 2007b). Notably the Arnhem Coast bioregion contains many important breeding sites for marine turtles and colonial seabirds, and roosting and feeding sites for migratory shorebirds (NRETAS 2007a).

Sandstone environments within the plateau host 22 endemic vertebrate species (three fish, two frog, eleven reptile, four bird and two mammal), among the highest in Australia including the Oenpelli python (*Morelia oenpelliensis*) and a large macropod, the black wallaroo (*Macropus bernardus*) (Woinarski et al. 2009:207). Depictions of thylacines (*Thylacinus cyanocephalus*) and Tasmanian devils (*Sarcophilus harrisii*) in rock art demonstrate the regional extinction of these species, perhaps as recently as 3,000 years BP (Woinarski et al. 2009:212) (see Appendix E).

Introduced species should also be noted as populations of water buffalo, horses, donkeys and pigs can be found throughout the study area (Albrecht et al. 2009; Woinarski et al. 2009). European settlement introduced these animals to the Cobourg Peninsula in the early 19<sup>th</sup> Century and they have subsequently spread throughout the region (Allen 2008). The introduction of water buffalo went on to have a profound impact not only on the environment, but also in terms of shaping the history of interaction between Europeans and Aboriginal groups in the region through the buffalo hunting industry in the late 19<sup>th</sup> and early 20<sup>th</sup> Centuries (discussed further in Chapters 5 and 6).

#### **1.0.4 The History of Culture Contact in Arnhem Land**

The interaction that Aboriginal people had with Macassans and early Europeans has been the subject of a number of studies over the past century (Berndt and Berndt 1954; Clarke 2000a, 2000b, 2002; Ganter 2006; Ganter et al. 2006; Macknight 1969, 1976, 1986, 2011; Mitchell 1994a, 1994b, 1995, 1996, 2000; McIntosh 1996a, 1996b, 2006, 2008, 2011, 2013; Morphy 1991; Warner 1932, 1937). For Groote Eylandt, Clarke (1994) divided this contact period into three phases. During parallel research in western Arnhem Land, Mitchell (1994)

expanded on the Berndts' two-phase contact model and developed a similar multi-phase model of contact similar to Clarke (1994). According to McIntosh (2006:162), it is possible to divide the contact experienced by the Yolngu of eastern Arnhem Land into different phases which are complex and resulted in vastly different social and economic outcomes as shown in Table 1. The first phase of this contact with the Bayini is believed to have been in a pre-Macassan time (McIntosh 1996, 2006, 2008, 2011). The phases of contact changed and fluctuated up to the present day depending on the actors involved.

**Table 1: Phases of contact with outsiders and the Yolngu (adapted from McIntosh 2006).**

Phase	Period	Outsiders	Description
1	Pre-1700s	Characterised by visits from the Bayini, Badu, or Wurrumula. Known as the whale and dugong hunters.	First visitors not dissimilar to the Yolngu who carried out a trade with them. Established a reciprocal relationship that allowed Bayini to visit Arnhem Land.
2	1700s to early 1800	Characterised as the 'Golden Age' of contact and cooperation with the Macassan trepangers.	A period of cooperation and trade which saw the importation of foods, cloth, knives, metal, tobacco and ceramics. Yolngu would camp nearby Macassan trepang stations. A steady exchange of ideas and cultural beliefs. Yolngu work and live with Macassans.
3	Early 1800 to 1906	Characterised as the 'Time of Fire' with relations between Macassans and Yolngu deteriorating. Influx of Europeans, i.e. British colonisers.	A period of steady decline in relationships after the massacre at Dholtiji. Practices non-conducive to cooperation i.e. prostitution of women, introduction of alcohol, violent quarrels. Some cooperation still occurred between Macassans and Yolngu in places. British colonisers begin to visit area and place controls on access. Yolngu reconsolidate to strengthen position in east Arnhem Land.
4.	1906 to present	Characterised as the Mission Time. Missions began in earnest in 1920s and 1930s in east Arnhem Land. World War II occurs and brings many servicemen into the region. Followed by mining in 1960s.	Yolngu begin to live at Mission settlements such as Yirrkala, Elcho Island and Milingimbi. Yolngu experience large social and economic changes caused by increasing influence from outsiders.

I argue here that culture contact in western Arnhem Land, like that of eastern Arnhem Land, responds to complex phases of economic history, being characterised by the following five discrete but overlapping economic and

political groups described below, each with its own distinctive material culture and potential influences. The history of culture contact in Arnhem Land has historical narratives from both European and Indigenous perspectives. A review of the literature reveals that there are a number of different agents involved in culture contact processes in Arnhem Land. These are described briefly below:

#### ***a. Pre-Macassans or Bayini***

There has been limited investigation into the history of Indigenous contact with the 'mythological' Bayini (or Baijini) (Berndt and Berndt 1954; Ganter et al. 2006; McIntosh 1994, 1996, 2008, 2011). Referred to in oral traditions as the Bayini, Badu, or Wurrumula, these people are identified as whale and dugong hunters and purported to be the first visitors to Arnhem Land (McIntosh 2006). According to McIntosh (2006), the Bayini were considered by the Yolngu to not be entirely dissimilar to themselves, and carried out a trade and are said to have established a reciprocal relationship that allowed Bayini to visit Arnhem Land. Sailing craft capacity for inter-island maritime activity was certainly occurring throughout the Indonesian archipelago pre-1800s (Clark 2011). Speculation by McIntosh (2006) suggests that the pre-Macassans may represent a Bugis diaspora or other maritime seafaring islanders from the western East Indies archipelago. Between 1667 and 1669 the Kingdom of Goa (Makassar Southern Sulawesi) was attacked and taken over by the Dutch East India Company (V.O.C) which resulted in a diaspora of Goa maritime communities throughout the western archipelago (McIntosh 2006). Another group that could constitute the pre-Macassans was the maritime community defined by Clifford Geertz as the *pasisir*, made up by Chinese, Malay, Bugis, and other local ethnic groups that were ruled by a Sultanate and engaged in

significant maritime trade and exchange networks known to be in existence between the 14<sup>th</sup> and 18<sup>th</sup> Centuries (Barnes 1995:497; Kian 2006; Vickers 1987).

### **b. Macassans**

The Macassans are acknowledged as the only positively identified non-European visitors to Australia. Macassans originate from the Kingdom of Goa, which was governed from Makassar. Macassan interest in north Australia was stimulated by the trepang (*bêche de mer* /sea slug/*Holothurium* sp.) trade with China. The nature of the Macassan trepang industry operating from Sulawesi, and the exploitation of this resource in northern Australia, have been discussed and described in great detail (Berndt and Berndt 1954; Bowdler 2002; Bulbeck and Rowley 2001; Clark and May 2013; Clarke 1994, 2000a; Ganter 2003, 2006; Ganter et al. 2006; Macknight 1969, 1972, 1973, 1976, 1986, 2008, 2013; Schwerdtner Máñez and Ferse 2010; Mitchell 1994a; Rowley 1997; Russell 2004; Sutherland 2000; Trudgen 2000; Warner 1932, 1937). Annual voyages were made from Makassar by fleets who sailed to Australia, driven by the north-west monsoon trade winds during the wet season in December-January. They made the return journey back to Sulawesi several months later when the seasonal winds came from the south-east (Macknight 1976; Clark 2011). Macknight (1976), Mitchell (1994a) and Schwerdtner Máñez and Ferse (2010) describe the history of the Macassan trepang operation in detail. Fleets of these fishermen worked the coastline, harvested trepang, and used land-based processing sites to prepare the catch for storage on the return journey to market. Areas of shallow coastal waters along the Arnhem Land coastline were highly productive trepang fisheries with many shore-based processing sites

located along the north Australian coast from the Cobourg Peninsula to Groote Eylandt. As discussed above, the timing of the beginning of the trepang visitation to the Arnhem coast is debated, with historians largely focused on a period post 1720, and a proliferation in the industry in the post-1780 period (Macknight 2008, 2011). The industry ceased in 1907 with the last Macassan prau recorded visiting the Cobourg Peninsula (Mitchell 1994a:42).

### ***c. English Fleets and Settlements***

During the early 19th Century, from 1824 to 1849, a series of settlements were established in succession on Melville Island and the Cobourg Peninsula. These settlements were primarily military outposts governed by the British Colonial Office to protect their northern interests (Allen 1972, 2008; Howard 1933; Mitchell 1994a; Powell 1988). They only lasted short periods of time owing to their failure to establish any viable and sustainable commerce and industry. This was the first period of sustained contact in northern Australia between English colonists and Aboriginal communities. Like the Macassans, there was a strong maritime focus for these settlements with all supplies, communication and commerce being conducted via the sea. These settlements were very small scale, involved low numbers of Europeans, and had limited environmental but large social impacts (Mitchell 1994a, 1996).

### ***d. Colonial Administration of the Northern Territory***

After a hiatus of 30 years, the economic settlement of the Northern Territory began in earnest with the establishment of Darwin (then called Palmerston) in 1879 by the South Australian Colonial Government (Powell 1988). This saw an intense drive for economic development in the Northern Territory through



pastoralism and mining. The first sustained European economic ventures in Arnhem Land and the Cobourg Peninsula involved buffalo shooting. Small bands of European shooters took over areas to exploit the large buffalo herds. The buffalo shooting industry was productive for 30 years until the end of World War I. During this time Europeans also tried to establish trepang and European, Japanese, Filipino, Torres Strait Islander, Indonesian and Malaysian pearling ventures in various localities in Arnhem Land (Burningham 1994; Trudgen 2000; Wells 2003). European presence in western Arnhem Land was limited to a handful of Europeans maintaining a permanent presence in the region.

#### ***e. Mission/Welfare Settlements and Governance***

It became increasingly clear, in terms of late 19th and early 20th Century technologies and economies, that Arnhem Land could not sustain productive agricultural or mining industries (Bauer 1964). The government therefore intervened with the establishment of Christian missions to provide basic welfare to Aboriginal people who had been wards of the State under the Protector of Aborigines. Missions were established at Gunbalanya (Oenpelli), Waruwu (Goulburn Island), and Minjalang (Croker Island) in the early 20th Century (Baker 2005; Cole 1975; Dewar 1992; Harris 1998). Thus began the most sustained and long lasting phase of culture contact interaction with Aboriginal groups in the region. The numbers of Europeans in western Arnhem Land escalated from World War I onwards, particularly with a peak of servicemen deployed to the region during World War II. There was still limited economic development in the inter-war years in the region with Missions undertaking some agri-business, crocodile and buffalo shooting, and pearling luggers continued to operate throughout the region (Bauer 1964; Burningham 1994;

Powell 1988; Roberts 2004; Trudgen 2000; Wells 2003). The bulk of the pearling industry during the inter-war years was made up of international Japanese pearling fleets (Morris 2010; Trudgen 2000:29).

### 1.0.5 Issues in the Chronology of Culture Contact

A revision of the timings of culture contact is an essential part of any historical and archaeological assessment of the past in northern Australia. As it currently stands, various sources argue that the beginning of culture contact with South East Asia lies anywhere within a time span of 500 years. McGrail (2004:287) cites a range of sources that speculate that mariners of Malay, Bugis, New Guinea and Makassar origin had been in contact with northern Australia as early as the 15<sup>th</sup> Century. The Australian Human Rights Commission (2008) published that 'From 1588 Macassan praus sailed to the north-eastern coast of the Northern Territory'. Furthermore, interpretative material and signage at the National Museum of Australia states:

*The earliest records of the Macassan traders can be traced back to the 17th century ... For over three hundred years they collected and processed sea slugs for trade with China ...*

*Macassans have visited north-eastern Arnhem Land over the last 400 years ...*

(Interpretative Signage National Museum of Australia 2009)

Perhaps it seems pedantic to be concerned with a start date for culture contact that may be plus or minus 100 years. However the interpretation of the nature and extent of the influence of South East Asian seafarers on Indigenous societies in northern Australia has developed into a major concern among anthropologists, historians, linguists, archaeologists, and the courts in determining native title claims (c.f. Evans 1992; Faulkner 2013; Ganter 2006; Ganter et al. 2006; Macknight 2008, 2011, 2013; McConvell 1990; McIntosh

1994, 1996, 2008, 2011; Peterson 2003; Strelein 2009). For Macknight (2008, 2011, 2013) the commencement of the Macassan trepang industry has become a singularly exasperating issue. Macknight (1969, 1976) originally provided strong evidence placing the beginning of the trepang industry in Makassar circa 1720. He then goes on to establish the evidence for the northern Australia trepang industry in operation circa 1780 based on his extensive inquiry into historical archival documentation of trepang catches (Macknight 2008, 2011, 2013).

The consequences of a shorter versus longer chronology of culture contact are significant when assessing the subsequent profound and substantial changes that occurred in Aboriginal society and economy that included language, religion, mobility, and economy. One example is the inclusion of more than 1000 Macassan/Malay/Bugis/Dutch words into Aboriginal languages (Evans 1992). Evans (1992:46) argues that these words were incorporated 'during a period lasting from around the late seventeenth century until 1906 when there were regular yearly contacts between Macassan visitors and coastal groups'. Thus these loan words were taken on by Aboriginal groups over a period of two centuries through regular and sustained contact with Macassans (Evans 1992). If we apply Macknight's (2008, 2011, 2013) timeline of contact then this intercultural exchange is reduced to less than 130 years. According to Peterson (2003) the issue of sustained Macassan contact with the same Aboriginal groups on an annual basis has not been effectively demonstrated. Regular records of the location and presence of Macassans occurs after European settlement on the Cobourg Peninsula and later establishment of customs stations after the 1870s.

Despite the growing volume of academic literature on Macassan and Indigenous Australian interaction, there have been no further investigations into the radiocarbon dating anomalies associated with the Macassan maritime industry in northern Australia since Macknight (1976), Mitchell (1994a) and Clarke (2000b). While the beginning of the Macassan trade with Aboriginal people along the Arnhem coast is debated, it had been previously accepted that the period from 1650 to 1720 was a probable starting time frame for the trepang industry (i.e. Macknight 1986:69; Ganter et al. 2006). Historical evidence from China suggests that Sea cucumbers/*bêche de mer*/trepang were known as a 'tonic' food in 1368-1644 (Macknight 2008). Documentary evidence of the annual trepang catch from records made by returning fleets to Sulawesi (Macknight 1969, 1976, 2008) chart the rise and fall in the trepang industry and show periods of intensification of the industry in the late 18th Century. However these records do not describe which parts of the Arnhem Land coastline the Macassans harvested the trepang.

Thus determining this record of resource exploitation becomes solely the domain of the archaeological investigation of trepang processing sites. It is presumably at these sites that the majority of culture contact took place. Without the need for shore-based processing, the nature of culture contact would have taken a significantly different turn. Macassan shore-based processing sites have been investigated by Macknight (1969, 1976) and Mitchell (1994a). Macknight (1969, 1976) attempts to put figures on the use of Malara (Anuru Bay A) based on the excavated material cultural remains, numbers of stonelines, and extensive evidence for intensive burning of firewood (see Figure 6). He concludes that the site could easily have accommodated numerous praus and a large number of crew. Macknight (1969, 1976) demonstrates that there are

three major Macassan trepang shore-based processing sites along the Arnhem Land coastline consisting of +10 stonelines representing concentrated regional industrial centres, including Anuru Bay. By comparison, the majority of other trepang processing sites consist of an average of four stonelines (Macknight 1969). The Anuru Bay complex of Macassan archaeological features attests to either a lengthy and repeated occupation, or to a short time frame of repeated occupations with very intensive production. In either scenario, Anuru Bay was likely to have been catering to a substantial number of Macassan trepang fishermen. Within the archaeological analysis of these sites, there has been limited investigation in identifying the initial occupation, frequency and subsequent abandonment of trepang processing.



**Figure 6: Photograph by Professor John Mulvaney of Anuru Bay (A) trench across Stonelines 1 and 2 and a trepang pit in 1966.**

Although there are numerous Macassan sites that have been documented along the Territory coastline, most consist of sparse archaeological elements

and features, and even fewer have been subject to radiometric dating (<4%) (Mitchell 1994a; Macknight 1969, 1976). Therefore, currently it is not possible to state with any certainty whether Macassans exploited eastern or western Arnhem Land first, or whether they exploited the entire coastline from the onset of the industry.

Further contributing to issues of antiquity of early culture contact are a number of serendipitous finds of material culture along the Northern Territory coastline. The discovery of an earthenware jar in Darwin Harbour in the Northern Territory dated to 490±25 years BP (1513±80 years AD) re-ignited the debate on the timing of European landfall (or by others) in northern Australia (Steinberg 2006:9). Initial investigations suggested that the earthenware pot is of southern European (Portuguese or Spanish) origin. The earthenware pots' presence in Darwin Harbour prompted a re-examination of the context of the environmental, social and historical settings of Portuguese exploration and contact in the 16th Century with northern Australia (Steinberg 2006:9).

In 2010, a schoolboy found a bronze swivel gun at Dundee Beach, 150 kilometres west of Darwin during an exceptionally low tide (Clark 2013). A portable x-ray fluorescence elemental analysis of the swivel gun by the Museum and Art Gallery of the Northern Territory identified the production provenance to South East Asia and not southern Europe (Clark 2013). Clark (2013:9-10) concludes the bronze swivel gun to have been brought to the location during the Macassan phase of visitation to northern Australia. Regardless, the find is still a significant and rare part of the maritime history of the Northern Territory providing confirmation of the distribution of Macassan mariners around the coastline.

Another serendipitous archaeological find during World War II by an RAAF serviceman consisted of a cache of ancient coins found on the Wessel Islands which became known as the 'Kilwa Coins' (McIntosh 2014:20). The cache consists of five copper coins from the Swahili port of Kilwa in modern day Tanzania, and four Dutch coins (McIntosh 2014:20). The Kilwa coins are dated between 700 and 800 years old (McIntosh 2014:20). Mitchell (1994a:49-50) postulates that the coin assemblage is derived from a post-1784 Macassan shipwreck. All three finds, the jar, swivel gun, and coins, have been explained as most likely originating from the Macassan phase of activity along the Northern Territory coastline (Clark 2013; Macknight 1976; McIntosh 2014; Mitchell 1994a:).

Returning to systematic archaeological investigations, evidence of 14<sup>th</sup> Century dates returned from three of the Macassan sites excavated by Macknight initially suggested that these sites could perhaps have been occupied as much as 800 years ago (Macknight 1986:70; Clarke 2000b:328). Macknight (1969, 1976, 2008) suggests that the three dates circa 800 BP are far too early to coincide with the current historic documentation for Chinese trade with Sulawesi and the archaeological material culture evidence (i.e. earthenware, ceramics) recorded at the Macassan sites. Macknight (1969, 1976, 2008) however has not yet posited any scientifically credible explanation for these dating anomalies at three disparate archaeological sites along the Arnhem Land coast (Clarke 2000b:328). This issue is dealt with in greater detail in Chapter 2. According to McIntosh (2006), the archaeological and mythological evidence points to ongoing visitation and exchange between the inhabitants of Arnhem Land and those from the Indonesian archipelago over a longer period than indicated by European records. Ganter et al. (2006:7) supports this position stating that it is

reasonable to expect that the trepang industry was 'grafted onto prior local knowledge' of the existence of resources in northern Australia.

Macknight (1969, 1976) proposes that the irregular dating in comparison with the historical evidence for the trepang industry arises from an 'old wood' problem most likely inherent in the mangrove wood used to fire the cauldrons. This conclusion was based on a limited sampling of locally available mangrove wood (Clarke 2000b:326). Clarke (2000b:327) states that a '... more rigorous program to test likely sources (of the problem) should be applied' and that Macknight's investigation was inadequate. Clarke (2000b:327) suggests that although historical accounts may be correct in dating the trepang industry to the mid-17th Century, it is '... possible that earlier visits involved smaller numbers of people and ships, and a different range of commodities such as sandalwood, pearl shell and turtle shell ...' that may have been sought by the Macassans or others. Clarke (2000b:328) also suggests that a better understanding of the early Indonesian pottery sequences from Macassan sites is warranted since there has been a further 30 years of research on South East Asian pottery. Studies of earthenware from Macassan trepang sites by Rowley (1997) and Bulbeck and Rowley (2001) have not been able to place the earthenware with any greater chronological certainty, other than being consistent with earthenware production in Sulawesi at any time from the 17<sup>th</sup> Century to the 20<sup>th</sup> Century. The issue regarding earthenware from Malara (Anuru Bay A) is discussed further in Chapter 3. McGrail (2004:293) reports that maritime archaeological finds continue to push back the timing of trade and commerce with Island South East Asia to the 14<sup>th</sup> Century illustrating the maritime capacity of the region. All of these factors suggest that research into this fugitive period



of north Australian history requires a shift from a terrestrial perspective to one that includes a greater contribution from a maritime approach (Cooney 2004).

### **1.0.6 Indigenous Participation in the Macassan Trepang Industry**

By the time Europeans had reached the area of coastline now known as Arnhem Land, Aboriginal groups must have been seasoned professionals in dealing with outsiders. Indigenous communities of the Wellington Range area were at the coalface of culture contact. However according to Peterson (2003:5) there are considerable gaps in our knowledge concerning Macassan and Aboriginal culture contact. He asks (2003:5):

*What were the conditions under which the Macassarese were able to live and work along the coast of Arnhem Land? Did they seek permission from Aboriginal people, were there payments from Macassan captains to local people to safeguard them from attack and to secure access and collaboration for the harvest of sea products? The evidence that exists for the Macassans acknowledging Aboriginal people's interests in the coastal waters is only circumstantial. There are no contemporary accounts from the period of Macassan visits that provide any definite evidence that the locations in which particular prau captains and their crew worked were regulated by Aboriginal people beyond the social relations established between the local Aboriginal people and the particular Macassan captains. How the exchange relations that were established with Macassans were interpreted either by the Macassans or the Aboriginal people at the time is unknown. (Peterson 2003:5)*

This is a significant problem for the interpretation of this fugitive period of Australian history. The issues raised by Peterson (2003) had a considerable bearing on the outcome of the Croker Island native title claim. Justice Olney had ruled that Aboriginal traditional owners could not claim exclusive possession of the ocean and sea bed (Strelein 2009:49). The issue centred on the perceived inability of Aboriginal people being able to deny the commercial use of the ocean and sea bed to Macassan trepang fishermen (Robinson and Mercer 2000:354). Despite the claim being presented in a holistic manner that ceremonial, economic and social values are inherent in the sea, the court was not satisfied that there was enough evidence of a commercial exchange

between Aboriginal groups and Macassan trepang fishermen, which in turn did not constitute evidence of Aboriginal people accepting a fiscal gain in exchange for use of the coastal waters (Robinson and Mercer 2000:354). This judgement was supported from the conclusion by Macknight (1976:83) that '... the Macassans were in no way dependent on Aborigines for labour or guidance or even permission to work'. Justice Olney (1998, para 121) specifically states:

*This evidence suggests no more than that the Macassans sought and received permission to take trepang from the waters around the islands. It falls short of establishing that the applicants' forbears had traded with the Macassans. Further, the evidence relates only to the gathering of trepang and not any of the sustenance resources of the sea. In view of the turbulent relationship which is said to have existed between the Macassans and the indigenous people in the early part of the 19th century and the large numbers of praus and crew that visited the area each year the likelihood that the Macassans' presence in the area was as the result of having first obtained the consent of the indigenous people would seem to be remote.*

Whereas Thompson (1949:53) noted from working with his Yolngu informants in eastern Arnhem Land that:

*[the Macassan seafarers] recognised the native ownership of the land and the surrounding waters, and paid tribute to the members of the local clans for the fishing rights.*

An exchange relationship between Macassans and Indigenous people was also recognised in a submission to the Aboriginal Land Commissioner in 1980 by a traditional owner from the central Arnhem Land coast (Dreyfuss and Dhulumburk 1980:14-15). Dhulumburk stated that:

*Mungatharra [Macassans] never built anything or stayed. They were here for a short time only. Mungatharra came only for trepang. They were exchanging tobacco, beads, cloth – useful things – exchanging for trepang – giving exchange (Dreyfuss and Dhulumburk 1980:14-15).*

There is also evidence further afield from Arnhem Land regarding the nature and negotiation of Indigenous labour relations attempting to determine their own terms in the engagement with different economies (Wells 2003). Wells (2003:189) stated that "they [Larrakia] worked when they wanted, for whom

they wanted and in the occupations they most enjoyed or deemed the most lucrative." However, the earlier pre-European level of participation by Indigenous groups in the trepang industry still remains a contentious issue. There is considerable difference of opinion between researchers, commentators and legal opinions on the issue of whether the historical relationship between Macassans and Aboriginals can be characterised as 'trade', 'exchange', or 'commerce'. These positions can be categorised in two main areas, one is a position of coercion (see Peterson 2003; Justice Olney in *The Commonwealth of Australian versus Yarmirr and Others* 2001), and the other is a position of equality and negotiation (McIntosh 1996, 2006, 2011; Clarke 1994; 2000a; 2000b; Clarke and Fredericks 2000). There is recognition by all that Aboriginal people participated in the trepang industry, assisted with crewing boats, and travelled back to Sulawesi with the Macassan fleets (see Macknight 1976, 1986; Mitchell 1994a; Clarke 1994; Warner 1936; Berndt and Berndt 1954).

Important factors in assessing the likelihood of coercion or negotiation are the cultural characteristics of Bugis and Macassarese which may influence the outcomes of negotiations and mediate conflict. These cultural characteristics become important mechanisms in negotiating culture contact between Macassarese/Bugis and Indigenous Australians. Bugis and Macassarese share similar problem-solving characteristics and beliefs which are commonly referred to as *Tellu Cappa* or 'Three Ends' (Tuwo 2012). This is a widely recognised process for resolving issues in mediation and conflict and consists of three phases:

- Use diplomacy to solve a problem.
- *Cappa Buto* or *Cappa Teme* (Penis End or Urine End) is to use marriage to knit closer kinship ties between two warring parties.

- *Cappa Badi* or *Cappa Kawali* (Dagger End) involves a fight to resolve the conflict should the other two ways not resolve the conflict.

A particularly strongly held cultural value for the Bugis is to face a problem and not run away from it, and not to be outdone by others (Tuwo 2012). Therefore the crew and captains of the trepang fleets had a culturally relevant conflict resolution system that would have suited negotiating within the cultural value system of Indigenous Arnhem Land people. Using a maritime historical assessment approach (c.f. Cooney 2004), that the trepang industry was conducted far from the territorial waters of the Macassan mariners suggests that the crews would have needed access to the following:

- Productive trepang fields.
- Shore-based processing areas.
- Fresh water.
- Littoral coastal exploitation for various resources and supplies.
- Safe harbours (protection from cyclones and wet season storms).

Access to land and sea was probably the most significant method for participation in the Macassan trepang industry. Macassan access to land and sea necessitated the need for formalised negotiation with local traditional land owners. Although trepang was not an important resource to Indigenous communities, it was the access to their land and sea that needed to be negotiated. As Russell (1996) summarises, in an analysis of the Macassan-Indigenous interaction in relation to the failed Croker Island native title case, the negotiation of access to space was tightly controlled and administered by traditional owners, especially the maintenance of sacred space. Reducing conflict was likely to be a priority for Macassan captains and crews as the

voyage to Australian was already a considerably dangerous maritime venture (Clark and May 2013:1; Adhuri 2013:198).

One of the main areas of evidence of the negotiation and commercial aspect of Indigenous engagement with Macassans unrelated to trepang was the collection of turtle and pearl shell. It was noted on a number of occasions in the 19<sup>th</sup> Century by European observers that pearl shell would be collected and stored by Aboriginal groups specifically for trading with Macassans. G.W. Earl (1854) noted in 1837 details regarding Macassan and Indigenous interactions in eastern Arnhem Land during his time at Port Essington:

*The inhabitants hereabouts reside chiefly upon the uplands, but resort during certain seasons to the spots frequented by the Macassar trepang fishers. With the people inhabiting Arnhem Bay and the adjacent country we are however, better acquainted, from the circumstance of many individuals from those parts having visited the settlement from time to time in the Macassar prahus. The trepang fishers describe this as being the most numerous and powerful tribe upon the coasts visited by them, and, when hostile, as being very formidable opponents. For some years past, however, they have been on the most friendly terms, and a considerable barter trade was carried on, tortoise-shell being very abundant there. (SMH 1854:4)*

Sir Oswald Walters Brierly (1848) noted during his voyage on the HMS Rattlesnake that Aboriginal people kept pearl shell hidden from Europeans because they preferred to trade with Macassans. Alfred Searcy, the Sub-Collector of Customs at Darwin from 1882-1896 (1909:32-3), also reported that:

*The natives [of the Arnhem Land coast] collected the pearls during the absence of the Malays for whom they saved them and received in exchange grog and tobacco. On all the outlying reefs at low-water pearl-shell could always be procured ... The Malays took away immense quantities of tortoise shell which was also collected by the natives.*

Earl (1846) made remarks on the difference between the Aboriginal people of western Arnhem Land and those of the eastern areas (i.e. Yolngu) in terms of their 'progress' towards commerce:

*... it is upon the northern coasts, where aborgines (sic) have long held intercourse with a people not greatly superior to themselves ...[that] They have*

here made the first step towards an improved condition. They have acquired the rudiments of commerce, and although the cultivation on the soil has not yet been attempted, they have learned to collect the natural productions of the country, with the view to exchanging them for food of a superior quality to that which their own land affords. A considerable number have paid one or more visits to Macassar, residing there for months together, which has familiarised them with the language and manners of the people of that country, and may probably lead to a closer intercourse, should the Macassars establish themselves upon the coast. (Earl 1846:118)

The most direct evidence of employment and participation in the trepang industry comes from an observation made by MacGillivray (1852:147) where he noted that Aboriginal people sold their labour to the Macassans and were sometimes paid in canoes.

During his time at Port Essington, Earl (1846:118) also noted that many Aboriginal people along the coast spoke Macassan. The proficiency in Macassan by Aboriginal people would have to indicate a close enough relationship that Macassarese/Buginese/Malay could be effectively learnt. Evans (1992) noted that the contact with Macassan trepang fishermen led to the sharing of around a hundred terms, of Macassan origin, across all the Iwaidjan languages, such as *mijang* for 'Macassan prau' from Macassarese *pamisseang* 'to row'; *binggu* 'adze for digging out dugout canoe' from Macassarese *bingkung*; *jimurru* 'east, northeast; easterly or north-easterly' from Macassarese *timoro* 'east wind'.

#### 1.0.7 Implications of Culture Contact in North Western Arnhem Land

These are significant issues when investigating culture contact in Aboriginal society in Arnhem Land. The significance of early maritime navigation, culture contact and cultural exchange are important research themes in Australian archaeology. Contact period archaeology provides a view of Indigenous perceptions and interactions with outsiders and the nature of the culture contact period from the Macassan maritime industry that cannot be gained from other

traditional sources. Much of the contact rock art has a specific maritime focus and is an important window into the interaction that Aboriginal people had with Macassan fleets and settlements of the time (Clarke 2000a). There is evidence that adoption of Macassan technologies and materials such as various tools, iron, glass, and the dugout canoe resulted in an intensification of the exploitation of marine resources, including turtle and dugong (i.e. Clarke 1994; Mitchell 1994a, 1994b, 1995, 1996, 2000, 1996; McIntosh 1996a). This hypothesis is supported elsewhere in the Arnhem Land region with evidence of a 'trading' relationship that led to changes in languages, travel to Makassar for a number of Aboriginal people, and the establishment of a trading network along the Australian coastline (Clarke 1994; Lamilami 1976; McIntosh 1996a; Morphy 1991; Thomson 1949).

Cultural impacts arising from Macassan interaction with Aboriginal people have always been described from a post-Macassan time after 1907. Various anthropological researchers have inferred that there were dynamic changes, with various social repercussions and a deeply influencing impact on art, ceremonial ritual and song cycles in eastern Arnhem Land (Morphy 1991). There is a significant body of evidence from historic, anthropological and archaeological sources that illustrates the level of Indigenous participation in the trepang industry in Arnhem Land (Berndt and Berndt 1954; Lamilami 1974; Morphy 1991, 1997, 1998; Warner 1932, 1937). Chaloupka (1993:192) believes there is evidence of Macassan visitation, interaction and influence on the Aboriginal society and economy in western Arnhem Land. Chaloupka (1993:192) states that as '... payment, they [Aboriginal people] received cloth, rice, tobacco and Dutch gin, and the treasured iron knives and tomahawks'. Thompson (1957:29-30) also states that items received from Macassans for use

in Indigenous territorial waters were '... in the form of goods or valuables called, collectively, 'gerri' and included dug-out canoes, calico, axes, knives, fish hooks, beads, smoking pipes and tobacco'. Aboriginal informants to Chaloupka (1994) and Thompson (1949) made specific references to their ancestors who received these goods as an exchange for taking resources from their territory, and not just as a 'donation' from opportunistic and chance meetings on the shore.

Clarke (1994) and Mitchell (1994a) suggested that this sustained contact with South East Asians created fundamental changes to the structure, subsistence and mobility of Indigenous coastal communities. These studies illustrate the pervasiveness of contact through documentary evidence in the archaeological record. Archaeological research on Croker Island and the Cobourg Peninsula undertaken by Mitchell (1994a, 1996) demonstrated that there were significant changes in the marine diet of Aboriginal communities in this region pre- and post-Macassan visitation. The premise was made that no dugong bones and limited turtle remains were recovered from pre-Macassan midden sites. In post Macassan contact archaeological sites there is a dramatic increase in the faunal remains of turtle and dugong presumably arising from the introduction of new technologies such as line fishing, metal harpoons and dugout canoes (Mitchell 1994a, 1996). Mitchell (1994a, 1996) also argues for a significant shift in residential settlement patterns with larger Aboriginal groups and decreased mobility. Evidence for these changes is reflected in the size and structure of shell middens and their faunal assemblages (Mitchell 1994a, 1996).

Clarke (1994) revealed Indigenous occupation on Groote Eylandt focused on coastal economies and that Macassans had a profound impact on Aboriginal



society (Clarke 1994). In research on Groote Eylandt, Clarke (1994:456) identified a 'landscape stratified according to a cultural definition of time'. Clarke (1994:456) found that there are three major phases of archaeology in the landscape, each represented by unique material culture. These three periods of occupation are the recent past, the Macassan period and the prehistoric past (Clarke 1994). Clarke established a chronology of human occupation over the past 2,300 years (Clarke 1994:466). Only one coastal shell midden had a date older than 500 years (Clarke 1994:466). Many archaeological sites date to the recent past (within the last 70 years) during the mission period of settlement on Groote Eylandt. This period is largely identifiable through oral testimony, ethnography, archives and archaeological remains that are mostly characterised as old peoples' camping places representing resource and land use during the Mission period (Clarke 1994:456). The Macassan era is beyond recent memory, but many places visited by Macassans are well known (Clarke 1994:456). Contact archaeological artefacts include pottery, glass, glass beads and flaked glass (Clarke 1994). The archaeological evidence suggested that Aboriginal people on Groote Eylandt focused mostly on a marine economic base, which became more intensified during the Macassan period (Clarke 1994:468). Pre-contact archaeological sites contained evidence of the exploitation of a wide variety of local resources with evidence of a high degree of seasonality (Clarke 1994:98). Post-contact archaeological sites (i.e. the Macassan period) contained evidence of the exploitation of a more limited range of resources available from immediate site environments with less emphasis on seasonality. Archaeological sites associated with Macassan activities were generally larger in area with evidence of a greater intensity and duration of occupation. This was interpreted through an increase in the diversity

and size of fish, turtle and dugong in sites owing to the addition and increase of line fishing. There was also an associated increase in exotic artefacts obtained from Macassans and raw material trade from the mainland (Clarke 1994:98). Unlike the pre- and post-contact sites, mission era sites contained evidence of exploitation of an extremely restricted range of resources and evidence for use of stone artefacts was rare with a variety of European introduced material culture (Clarke 1994:99).

Chaloupka (1993, 1996) has reported on the identification of contact rock art motifs and chronology related to contact with Macassans in the Wellington Range. Chaloupka (1996) identified two regions of the Northern Territory that contain the majority of rock art related to Macassan culture contact—Groote Eylandt and the Wellington Range. It is no coincidence that the major trepang processing site, Malara (Anuru Bay A) is located less than 15 kilometres north of the Wellington Range (Chaloupka 1996; Macknight 1976) (see Figure 1). Chaloupka (1993, 1996) found that the greatest diversity of introduced imagery in Arnhem Land occurs in the Wellington Range.

Therefore according to Chaloupka (1993:192) it is expected that '... shards of traded pottery, flakes from the thick green glass of Dutch gin bottles, and paintings depicting Macassan subjects ...' should be found as part of the culture contact Indigenous archaeological record in western Arnhem Land (Chaloupka 1993:192). However, systematic and quantitative research of contact archaeological assemblages has largely been overlooked in past archaeological studies on mainland Arnhem Land beyond minor references to presence and absence (Schrire 1982; Jones et al. 1985).

Importantly, Chaloupka's (1993:192) research into the decorative elements of rock art suggests similarities in design elements and motifs between western Arnhem Land rock art and Indonesian woven textiles such as 'hatching, diamond and lozenge designs as well as patterned parallel, horizontal and vertical blocks' which he believes may be 'based on such fabrics'. Joanna Barkmann (pers. comm.), former curator of South East Asia Textiles, Museum and Art Gallery of the Northern Territory has suggested this link warrants further study. Apart from the mention in Chaloupka's (1993, 1996) influential publications on culture contact rock art, there has been little exploration of this hypothesis regarding the decorative elements of art in the Wellington Range and the influence of culture contact in this regard.

The influence of other cultures on Indigenous groups in Arnhem Land has long been of significant interest to anthropologists. The Berndts' wrote extensively on the influence of the Macassans and Europeans and this has been a continuing trend in Aboriginal studies in Arnhem Land (Berndt and Berndt 1954), although it was Mountford (1956) who was among the first to take an interest in contact rock art from Groote Eylandt and Arnhem Land. On Groote Eylandt, the contact imagery is largely about Macassan contact (Mountford 1956:99; Clarke 2000). Whereas in western Arnhem Land, Mountford (1956:159) noted the presence of contact imagery at rock art sites near the East Alligator River of a ship and a building. Contact imagery in rock art was not dealt with in any significant way until Chaloupka (1993) discussed the introduction of European and Macassan imagery in the 'Contact Phase'.

Contact Phase maritime activity, Macassan and European, is extensively illustrated from the coast to the top of the plateau in western Arnhem Land

(Burningham 1994, 2000; Chaloupka 1993, 1996; Roberts 2004; Roberts and Parker 2003). The buffalo shooting industry also had a major influence on Aboriginal society in Arnhem Land and was reflected in the contact rock art phase (Chaloupka 1993; Roberts 2004; Roberts and Parker 2003). Introduced stock and animals (horses, pigs, goats and cats), were given language names and are also featured in the rock art (Chaloupka 1993:201). Chaloupka (1993:194) suspects that early depictions of firearms in rock art reflect an early understanding that these objects were weapons. Chaloupka (1993:191) considers the 1920s as the period when rock art in the northern and western escarpment regions ended except for a few individual artists. The chronology of rifles in the rock art tends to reflect this pattern, although it is likely to have occurred up to the 1940s in some areas (e.g. Djulirri, Wellington Range). Chaloupka (1993) illustrates the contact period with a number of images of firearms, however with limited discussion of their significance within Aboriginal society. Chaloupka (1993:194-197, 201) recorded at least three images of Martini-Henri rifles with two images of firearms likely to date back to the pre-1850s era.

Therefore the culture contact period presents a challenge for documenting the Indigenous history of Arnhem Land. The period of Indigenous history prior to European contact and settlement in Australia is traditionally perceived as the domain of archaeology. However, in writing the Indigenous history of Arnhem Land, we draw not only from archaeology, but from European historical records, and the oral history and traditions of the Arnhem Land people themselves. Watson-Andaya (2006:675) indicates that in the study of history, one of the most effective means of tracking such connections in early times is through a consideration of trade and economy.

### 1.0.8 Interpreting Culture Contact Archaeology

Turner et al. (2003:440) draws the conclusion that not only are Indigenous peoples drawn to areas having a high incidence of ecological edges, but furthermore, that they actively create and maintain ecological edges. This also equally applies to zones of cultural transition. Concepts of ecotone biodiversity, ecological edges, and resilience are not new to ecological sciences. It is suggested that these concepts may apply to cultural interfaces that allow people to exchange and transfer many types of goods, technologies and knowledge between groups (Turner et al. 2003:452). Examples of how this exchange occurs are well established in archaeological and historical literature. It is the mechanisms behind Indigenous groups' utilisation that reflects ecological edges that Turner et al. (2003) are interested in.

*Not only are products of diverse regions and ecosystems shared and redistributed when cultural groups meet and mingle, so too are concepts, skills and technologies, narratives, names, dances and songs, religious ideas, and linguistic traits and vocabulary. (Turner et al. 2003:452)*

Furthermore, Spyer (1997:532) identifies the issue of the European ideal captured in histories of Australia, of grossly unequal gift exchange where the explorer or settler might give an Indigenous person a glass bead and they reciprocate with an item (i.e. a pearl) of far greater value (Greenblatt 1991:110; cf. Pietz 1987:41). Therefore the narrative regarding contact archaeology can easily end up socially and economically biased.

Explaining change in archaeological societies has drawn on models from anthropological studies of hunter-gatherer societies (Bamforth 1988; Jochim 1979; Kelly 1983; Steward 1938, 1977; Thomas 1973, 1989). Altman (2006:36) has conducted research into contemporary Indigenous economies in northern Australia and has developed a hybrid economy framework as an 'analytical

construct for the assessment of the particularities of any one situation and the linkages between the market, the state and the customary components of the economy'. The hybrid economy model is an appropriate approach for the analysis and interpretation of culture contact history in Arnhem Land where Indigenous communities interacted with outside market and state forces as well as negotiating their own traditions and customary systems. As described earlier in relation to the Croker Island native title case, significant issues were found in the interpretation of Aboriginal and Macassan contact, trade and exchange.

Contact between Aboriginal groups, Macassans and Europeans resulted in a complex set of circumstances rather than simple two-way interactions. As stated by Altman (2006:36), it is the linkages and interdependencies that arise between these three groups that are complicated and influenced by market, political and social forces. Therefore the social, behavioural and economic outcomes for Indigenous communities in Arnhem Land were greatly influenced by these interactions. The emergence of hybrid economies occurred throughout colonial Australian Indigenous societies (c.f. Keen 2010). The hybrid economy model is based on a three-sector approach consisting of a customary sector, a market sector and a state sector (Altman 2001, 2003, 2005, 2006, 2007, 2009). For a detailed discussion of the hybrid economy model and its application in contemporary Indigenous society, see Altman (2001, 2003, 2005, 2006, 2007, 2009). The customary sector includes Indigenous subsistence, non-market, non-monetary, informal, non-mainstream, cultural and traditional-economy (Altman 2001). It is possible to interpret the hybrid economy model in the following table.

**Table 2: Sectors of the modern Hybrid Economy (Altman 2001:5).**

Sector	Definition
Customary	The customary economy is made up of a range of productive activities that occur outside the market and that are based on cultural continuities: hunting, gathering and fishing occur within the customary economy, but so too do a range of other activities like land and habitat management, species management and the maintenance of biodiversity. A distinctive feature of the customary economy is that it is not monetised.
Market	The market can best be conceptualised as the productive private sector; it is always evident, but often more in a consumptive than a productive manifestation. In its productive form the market is often very small and might include the retail sector, the arts industry, commercial wildlife harvesting, local entrepreneurial activity and, in some situations, articulation with the mining and tourism sectors.
State	The state is present on Aboriginal land in many manifestations as a service provider to citizens, as provider of the welfare safety net, as law enforcer, and as regulator.

These three sectors then interact in various ways as shown in Figure 7 below.

Altman (2001, 2005, 2007) discusses linkages and interdependencies between the three sectors which then creates seven sub-separate sectors where each major sector intersects. Each sub-sector is not only governed by different modes of economy, but also by very different social, religious, property ownership and governance modes. Although Altman (2001) articulates the theory of hybrid economies in terms of modern contemporary Australia, this model is equally applicable in the pre- and post-colonial periods where Aboriginal society had come into contact with non-Aboriginal societies (c.f. Keen 2010). The hybrid economy model can be articulated for the Arnhem Land study area in the following way shown in Table 3.

## The Hybrid Economy



Figure 7: Hybrid economy model (Altman 2007:3).

Table 3: Sectors of the Hybrid Economy model occurring in relation to the study area.

Major Sector	Definition	Sub-Sectors
1. State	Colonial	4,5,7
	State – South Australia	4,5,7
	Commonwealth	4,5,7
	Mission	4,5,7
2. Customary	Traditional Arnhem Land Aboriginal Society	2
3. Market	Macassan trepang industry	5,6,7
	Buffalo shooting	6
	Pearling maritime industry	6
	Agri-forestry	6
	Mission - Arts and Crafts	6,7

Indigenous customary beliefs, rules, and desires obviously have a direct impact on how the conventions of contact between each society developed. Indigenous customary society is governed by a complex set of beliefs that determine land tenure, kinship and spiritual affiliation (discussed in greater detail in later



chapters). The market sector includes both Macassan and European enterprises. The Macassan presence in north Australia did not occur out of expansionist colonial interest, but was solely driven by market forces (Knapp and Sutherland 2004). Maritime expeditions to Australia were governed by supply and demand market forces from China. The Macassan trepang catch had various peaks and troughs in response to Chinese demand (Knapp and Sutherland 2004). The highly mobile nature of South East Asian mariners would also have negated the need to establish permanent settlement in north Australia (Stacey 2007). Therefore, Macassan interest in north Australia can be defined as the seasonal exploitation of natural resources with the need for localised areas for onshore processing and limited provisioning. There is no evidence for Macassans laying claim to particular territories in Australia other than a general title of *Marege*, although they may have considered Australia as part of their sphere of influence and resource entitlement (Macknight 1969, 1976; McIntosh 2008). Therefore Macassan activity falls solely within the market sector and Indigenous participation in this industry places this within Altman's model into sub-sector 6.

When discussing European economies there are a number of similarities to the mobile and seasonal nature of the trepang industry. However the major difference between European and Macassan economic endeavours is that Europeans had the legal right of the state to intervene and give legal title to an industry proponent when necessary. Industries such as buffalo shooting and pearling were highly seasonal in the nature of their operations and included Indigenous labour, which places these interactions within sub-sector 6 (Levitus 1995; Wells 2003). Wells (2003:190) notes that it was "no coincidence that the saltwater people were readily engaged on pearling boats." Localised harvesting

of native timbers (principally *Callitris intratropica* and *Erythrophleum chlorostachys*) also occurred intermittently in north western Arnhem Land from the time of European settlement up to about the 1960s (Grant 1995; Woinarski and Baker 2002). Ironwood (*Erythrophleum chlorostachys*) and Cypress Pine (*Callitris intratropica*) became favoured sources of timber owing to their termite resistance and were used in the establishment of European settlements and related infrastructure (Woinarski et al. 2002a, 2002b). The 20<sup>th</sup> Century saw Arnhem Land declared a reserve and the Aboriginal inhabitants classified as wards of the state (Altman 2003:67). Furthermore, according to Trudgen (2000:29), malaria and an influenza pandemic swept across Arnhem Land in 1917-1919 which is likely to have had significant impacts on local Indigenous populations. The loss of a large part of the population, along with the partial acculturation to the shooting and pastoral industries must have had a significant impact on the traditional Indigenous economies.

Increasingly, missions and government settlements attempted various commercial developments in Arnhem Land with cheap Aboriginal labour (Altman 2003:67). The various commercial enterprises included forestry and sawmilling, cattle and buffalo pastures, dairy farming, market gardens, orchards, fishing ventures, a piggery and poultry projects which all failed to be sustainable beyond very limited periods of operation (Altman 2003:67). It was noted that whilst Aboriginal labour was largely used to make missions more commercially viable, there are references to Aboriginal people undertaking customary practices (i.e. hunting and gathering) which subsidised the mission operational costs (Webb 1938). Therefore, although Missions fall within the bound of imposing state authority, they played a significant role in developing regional economies and these activities would fall within sub-sector 7.

The European state emerged during initial attempts of colonisation during the early 19<sup>th</sup> Century, but it was only after 1880 that the Australian state began to impose authority with regularity on Indigenous people in Arnhem Land (Allen 1972, 2008; Mitchell 1994a; Powell 1988). The establishment of settlements and missions across Arnhem Land with powers from the Protector of Aborigines began in earnest in the early 20<sup>th</sup> Century (Baker 2005; Dewar 1992; Harris 1998; Mulvaney 2004; Webb 1938). One of the earliest examples of these permanent settlements was established by Paddy Cahill in 1906 at Oenpelli after being appointed local Protector of Aborigines (Mulvaney 2004). At these government-mandated settlements, Indigenous engagement in regional economies falls largely within sub-sector 7, as a result of intervention by the state and the market. An example at Goulburn Island is the attempt by the Mission to curate and produce commercial Indigenous craft items such as basket ware, mats, and fans (Webb 1938:62).

As Indigenous society responded and adapted to state and market sectors, subsequent changes were manifested in Indigenous religion, economy, and marine and terrestrial subsistence strategies. These transformations are proposed to be reflected in the production of rock art and residential mobility represented in the archaeological sites in the Wellington Range. Lamilami (1974) tells us that there continues to be occupation of the mainland after contact with Macassans and later establishment of the Goulburn Island mission. Therefore there should be significant change found in the occupation, material culture, and rock art assemblages such as those found by Mitchell (1994a) and Clarke (1994).

The occurrence of post-contact rock art, although not rare in the Northern Territory, is found in large quantities in Arnhem Land. Contact rock art is concentrated in particular areas and the Wellington Range is one such area (Chaloupka 1974, 1993, 1996). Frederick (2000) discussed the problematic nature of contact rock art which in the past was largely defined by the presence (and absence) of introduced imagery (i.e. Europeans, ships, firearms, animals). Clarke (2000a) proposed that the production of contact rock art provided a place of contact and also a context for mediating cross cultural exchange through the creation of pictures that mediate and communicate this exchange and interaction. Indeed, it is known that throughout the culture contact period, despite external influences and loss in populations through disease and migration, Aboriginal society still maintained many fundamental traditions and customary practices (Berndt and Berndt 1954, 1996; Brockwell et al. 1995; Chaloupka 1993; Evans 2003; Toohey 1981). Culture contact fundamentally changed Indigenous society through trade and exchange, language and social status, and was a major factor in producing the post contact boom in social economies noted by Berndt and Berndt (1954), Mitchell (1994b, 2000), and Thomson (1949). These changes are not continuous, nor are they uniform in space and time. Changes are influenced by the many phases in which Indigenous society interacts with the different economy sub-sectors. Each phase results in a specific set of changes and responses in Indigenous society in the research area.

## 1.1 METHODOLOGY

A major reason for investigating the archaeology of the central Wellington Range is owing to its unique location in northern Australia. During the late Pleistocene, 25,000 years ago, the central range was located approximately 220 kilometres from the coastline which places it within close proximity to the important coastal colonisation corridors (Bird et al. 2002; Davidson 2013; Hiscock 1999; O'Connell and Allen 2004; Roberts et al. 1990; Taçon, P.S.C. and S. Brockwell. 1995; Terrell and Pope 2008). By 8,000 to 6,000 years ago, the stabilisation of sea levels places the coastline within 15 kilometres of the Wellington Range resulting in a significant loss of land mass during the intervening period of approximately 20,000 years. The range goes from being exclusively an inland sandstone outlier surrounded by undulating sand plains to becoming a coastal sandstone outlier of the Arnhem Land plateau. Therefore, the Wellington Range is well suited for finding evidence of culture contact and subsequent changes in Indigenous occupation owing to its proximity to the sea.

### 1.1.1. Participatory Consultation and Cultural Heritage Management

Importantly the project included participatory planning workshops to seek input from Traditional Owners to develop a research plan that met both the Australian Research Council research goals and those of the local community. Such models have proven to be successful in that they promote culturally appropriate methods of consultation and create an open dialogue with Indigenous peoples, which in turn structures the training and development that builds long term Indigenous capacity. Participatory development or resource mapping is a process of engagement with a defined group of people to help identify local resources, by providing ownership of the process and outcome (Johnson and

Mayoux 1998:151). The participatory planning framework adopted during the course of the project attempted to effectively meet the concerns of the Manganowal Traditional Owners of the Namunidjbuk Estate with a focus on the delivery and coordination of cultural heritage management of Indigenous and Macassan cultural heritage places (Guse 2006). Collaboration with Traditional Owners assisted introducing them to cultural heritage management practices.

This study aimed to utilise appropriate consultation methods for working with Indigenous Australian communities on cultural heritage research. An aim of the research was to assist with building the capacity of Indigenous communities to implement economically and environmentally sustainable Indigenous cultural heritage programs. Participatory consultation methods are commonly used in developing nations in the assessment and implementation of aid projects. Such models have proven to be successful in that they promote culturally appropriate methods of consultation and create an open dialogue with Indigenous peoples, which in turn structures the training and development that builds long term Indigenous capacity. Pre-fieldwork consultations were undertaken in western Arnhem Land at Waminari Bay in 2008 at a Stepping Stones workshop led by Nicholas Hall to discuss the archaeological project with the Manganowal Traditional Owners. A week-long workshop was undertaken with Traditional Owners and stakeholders to plan and discuss cultural heritage issues and research for the area. The resulting document, the 'Malarrak Management Plan' was produced from this workshop by Stepping Stones. In the course of developing the ARC Linkage Grant and during the project, Ronald Lamilami and I made presentations and maintained constant dialogue with the West Arnhem Regional Council, and the Jabiru Regional Office of the Northern Land Council.

A range of cultural heritage management objectives were listed for the ARC Linkage project. The project liaised closely with staff from the Heritage Branch (Director Mr Michael Wells), Department of Natural Resources, Environment, Arts and Sport (NRETAS) and the Northern Land Council during the course of the fieldwork. Meetings were held at Waminari Bay and at various rock art sites between staff, the ANU project team, and Traditional Owners regarding the proposed Northern Territory Heritage Register (NTHR) heritage declaration of the Djulirri Indigenous archaeological rock art site and the future conservation of the Anuru Bay Macassan site. The Traditional Owners pursued a heritage declaration to ensure further protection and conservation efforts for this significant Indigenous archaeological site. Reports were prepared for the Djulirri rockshelter and Malara Macassan site to be listed on the Northern Territory Heritage Register. GPS mapping of the Djulirri archaeological site precinct provided digital data to the Northern Territory Government for this heritage declaration process. Djulirri was added to the NTHR in 2010.

Numerous meetings were held with Commonwealth and Territory government representatives (including the Northern Territory Government Minister for Environment and Heritage) regarding Indigenous Protected Area listing for the research area. Liaison with linkage partner NT Bushfires Council to document fire regimes was progressed during the field work. The archaeological research produced from this study will contribute significantly for the promotion and establishment of an Indigenous Protected Area and Commonwealth national heritage listing.

### 1.1.2. Survey and Site Recording

A total of four annual field research seasons were undertaken from 2008 to 2011. Pedestrian site survey of the study area was conducted of the Goulburn Island, Anuru Bay, Wellington Range and Red Lily Lagoon study areas to determine the distribution and density of archaeological places and features. Preliminary recording of the rock art assemblages and test excavations were conducted at selected major sites with an extended excavation at three rock shelters plus detailed rock art recording. Site recording undertaken in the field used hand-held GPS (Global Positioning System with sub-5 metre accuracy) recording site positions, elevations, proximity to water sources and natural resource zones and relevant geomorphological data (c.f. Hiscock 1989). This data was entered into a database to facilitate the analysis of archaeological, environmental and ethnographic site data. Archaeological survey and excavation was undertaken with the assistance and participation of the Traditional Owners. These initial rock art surveys were assisted in the field by Professor Paul Taçon (Griffith University) and Dr Sally May (The Australian National University) who assisted with the rock art site surveying using the methodology presented in Figure 8 and Figure 9 below, and collaborated on the detailed rock art recording in the Wellington Range at major contact rock art assemblage sites. Figure 8 and Figure 9 are examples of the site recording form used in this project to document archaeological sites in the study areas following the principles outlined by Hiscock (1989). The following characteristics were recorded of each archaeological site location below:

- Location, recorded by hand-held GPS using MGA94 coordinate system.
- Site environment: basic details of land unit, geomorphology, vegetation.



- Site mapping in the form of a sketch map of the site locality in reference to topography, drainage and other features.
- Site dimensions: basic dimensions through estimated, tape or laser distance measurer methods.
- Site contents: basic details of types of artefacts, contact artefacts, estimated density, raw materials and shell species (see Sections 1.1.4, 1.1.5, 1.1.6 and 1.1.7).
- Details noted regarding ethnographic content: Aboriginal, European and Macassan.
- Disturbance factors impacting the site.
- Rock art styles and motif types represented at the site (see Section 1.1.9). Recording method and media used for rock art execution. Estimated densities of rock art motifs at each site.
- Photographs of each site.

<b>SITE RECORDING FORM</b>		<b>SURVEY</b>			
<b>SITE NAME</b> <input style="width: 100%;" type="text"/>					
Recorder/s <input style="width: 150%;" type="text"/>			Date <input style="width: 100%;" type="text"/>		
Easting <input style="width: 100%;" type="text"/>			Mapsheet <input style="width: 100%;" type="text"/>		
Northing <input style="width: 100%;" type="text"/>			Datum <input type="checkbox"/> GDA94 <input type="checkbox"/> AUS66		

<b>ENVIRONMENTAL CONTEXT</b>		<b>Geomorphic Context</b>	
<input type="checkbox"/> Coastal Plain <input type="checkbox"/> Alluvial Plain <input type="checkbox"/> Undulating Sandy Plain <input type="checkbox"/> Dissected Foothills <input type="checkbox"/> Rocky Strike Ridge <input type="checkbox"/> Arnhem Plateau <input type="checkbox"/> Tablelands	<input type="checkbox"/> Dense open woodland <input type="checkbox"/> Sparse open woodland <input type="checkbox"/> Monsoon Vineforest <input type="checkbox"/> Paperbark Swamp <input type="checkbox"/> Riparian Creek Zone <input type="checkbox"/> Grassland	<input type="checkbox"/> Bloodwood <input type="checkbox"/> Woollybutt <input type="checkbox"/> Northern Box <input type="checkbox"/> Round Leaf Box <input type="checkbox"/> Stringybark <input type="checkbox"/> Salmon/Ghost Gum <input type="checkbox"/> Spindle <input type="checkbox"/> Sorghum Understorey <input type="checkbox"/> Other	<input type="checkbox"/> Outlier <input type="checkbox"/> Escarpment Base <input type="checkbox"/> Tor <input type="checkbox"/> Hilltop <input type="checkbox"/> Hillside <input type="checkbox"/> Creek/Levee Bank <input type="checkbox"/> Saddle <input type="checkbox"/> Sandsheet <input type="checkbox"/> Laterite Surface
<input type="checkbox"/> Water: <input style="width: 100%;" type="text"/>		<b>Sandstone</b> <input type="checkbox"/> Meta-Sandstone <input type="checkbox"/> Coarse Grained <input type="checkbox"/> Fine Grained <input type="checkbox"/> Conglomerate	

<b>SITE CONTEXT</b>		Length <input style="width: 50%;" type="text"/>	Width/Depth <input style="width: 50%;" type="text"/>	Height <input style="width: 50%;" type="text"/>
<input type="checkbox"/> Shelter <input type="checkbox"/> Cave <input type="checkbox"/> Bluff Face <input type="checkbox"/> Exposed Boulder <input type="checkbox"/> Outcrop Surface <input type="checkbox"/> Other: <input style="width: 100%;" type="text"/>	Site Aspect <input style="width: 50%;" type="text"/>	# Art Panels <input style="width: 50%;" type="text"/>	Deposit <input style="width: 50%;" type="text"/> cm	
<b>Description</b> <input style="width: 100%; height: 20px;" type="text"/> <input style="width: 100%; height: 20px;" type="text"/> <input style="width: 100%; height: 20px;" type="text"/>				

<b>SITE FEATURES</b>		<b>Stone Artefacts</b>		<b>Raw Materials</b>	
<input type="checkbox"/> Petroglyphs <input type="checkbox"/> Pictographs <input type="checkbox"/> Grinding Hollow <input type="checkbox"/> Cultural Deposit <input type="checkbox"/> Stone Arrangement <input type="checkbox"/> Hearth <input type="checkbox"/> Stone Artefacts	<input type="checkbox"/> Quarry (Surface/Hardstone) <input type="checkbox"/> Knapping Floor <input type="checkbox"/> Faunal Remains <input type="checkbox"/> Shell <input type="checkbox"/> Human Skeletal Remains <input type="checkbox"/> Contact Material <input type="checkbox"/> Wooden Implements <input type="checkbox"/> Steel Implements	<input type="checkbox"/> Flakes <input type="checkbox"/> Retouched Flakes <input type="checkbox"/> Core <input type="checkbox"/> Flake Piece <input type="checkbox"/> Grinding Stone <input type="checkbox"/> Hammerstone <input type="checkbox"/> Axe	<input type="checkbox"/> Bifacial Point <input type="checkbox"/> Unifacial Point <input type="checkbox"/> Blade <input type="checkbox"/> Cylocon	<input type="checkbox"/> Quartzite <input type="checkbox"/> Sandstone <input type="checkbox"/> Meta-SST <input type="checkbox"/> Silcrete <input type="checkbox"/> Chert <input type="checkbox"/> Siltstone	<input type="checkbox"/> Quartz <input type="checkbox"/> Hornfels <input type="checkbox"/> Tuff <input type="checkbox"/> Granite <input type="checkbox"/> Dolomite
<b>DENSITIES</b> Max/m <input style="width: 50%;" type="text"/> Min/m <input style="width: 50%;" type="text"/> Alt/m <input style="width: 50%;" type="text"/>		<input style="width: 100%; height: 20px;" type="text"/> <input style="width: 100%; height: 20px;" type="text"/> <input style="width: 100%; height: 20px;" type="text"/>			

<b>CHRONOLOGICAL ROCK ART STYLES</b>		<b>MID HOLOCENE</b>		<b>LATE HOLOCENE</b>	
<b>EARLY</b> <input type="checkbox"/> 3MF Stencils <input type="checkbox"/> Large Naturalistic <input type="checkbox"/> Dynamic Figures <input type="checkbox"/> Hand Stencils <input type="checkbox"/> Engravings	<b>EARLY HOLOCENE</b> <input type="checkbox"/> Post Dynamic Figures <input type="checkbox"/> Simple Figures with Boomerangs <input type="checkbox"/> Northern Running Figures <input type="checkbox"/> Mountford Figures	<input type="checkbox"/> Yam Figures <input type="checkbox"/> Large Fauna Style <input type="checkbox"/> Large Human Figures <input type="checkbox"/> Simple Figures <input type="checkbox"/> Early X-Ray <input type="checkbox"/> Early Decorative Infill	<input type="checkbox"/> X-Ray <input type="checkbox"/> Complete Figure <input type="checkbox"/> Beeswax <input type="checkbox"/> Contact <input type="checkbox"/> Complex Decorative		

<b>ROCK ART MEDIA/METHOD</b>	
<b>Pictograph</b>	
Method	<input type="checkbox"/> Fingerstroke <input type="checkbox"/> Brushed <input type="checkbox"/> Stenciled <input type="checkbox"/> Indeterminate <input type="checkbox"/> Imprint <input type="checkbox"/> Other
Form	<input type="checkbox"/> Full Bodied <input type="checkbox"/> Outline <input type="checkbox"/> Line (Stick) <input type="checkbox"/> Indeterminate <input type="checkbox"/> Decorative Infill <input type="checkbox"/> Other
Colour	<input type="checkbox"/> Red <input type="checkbox"/> Yellow <input type="checkbox"/> White <input type="checkbox"/> Black <input type="checkbox"/> Blue <input type="checkbox"/> Monochromatic <input type="checkbox"/> Bichromatic <input type="checkbox"/> Polychromatic
<b>Petroglyph</b>	
Method	<input type="checkbox"/> Pecked <input type="checkbox"/> Incised <input type="checkbox"/> Other
Surface Prep	<input type="checkbox"/> Abraded <input type="checkbox"/> Pecked <input type="checkbox"/> None <input type="checkbox"/> Other
Form	<input type="checkbox"/> Full Bodied <input type="checkbox"/> Outline <input type="checkbox"/> Line Drawing (Stick) <input type="checkbox"/> Indeterminate <input type="checkbox"/> Other

Figure 8: Page 1 of site recording form used in the rock art survey in the Wellington Ranges.

<b>ROCK ART MOTIFS</b> <input type="checkbox"/> Zoomorphic					
<input type="checkbox"/> <b>Mammal</b> <input type="checkbox"/> Dingo <input type="checkbox"/> Bandicoot <input type="checkbox"/> Possum <input type="checkbox"/> Echidna <input type="checkbox"/> Flying Fox <input type="checkbox"/> Macropod <input type="checkbox"/> Agile Wallaby	<input type="checkbox"/> <b>Reptile</b> <input type="checkbox"/> Blue Tongue Lizard <input type="checkbox"/> Frilled Neck Lizard <input type="checkbox"/> Goanna <input type="checkbox"/> Salt Crocodile <input type="checkbox"/> Fresh Crocodile <input type="checkbox"/> Snake <input type="checkbox"/> Python <input type="checkbox"/> Long Neck Turtle <input type="checkbox"/> Short Neck Turtle	<input type="checkbox"/> <b>Fish</b> <input type="checkbox"/> Barramundi <input type="checkbox"/> Saratoga <input type="checkbox"/> Forktail Catfish <input type="checkbox"/> Eeltail Catfish <input type="checkbox"/> Mullet <input type="checkbox"/> Black Bream <input type="checkbox"/> Long Tom <input type="checkbox"/> Archer <input style="width: 100px; height: 20px;" type="text"/> Other	<input type="checkbox"/> <b>Marine</b> <input type="checkbox"/> Shark <input type="checkbox"/> Dugong <input type="checkbox"/> Dolphin <input type="checkbox"/> Whale <input type="checkbox"/> Stingray <input type="checkbox"/> Crustaceans	<input type="checkbox"/> <b>Mega/Extinct Fauna</b> <input type="checkbox"/> Thylacine <input type="checkbox"/> Thylacaleo <input type="checkbox"/> Tas Devil <input type="checkbox"/> Sthenurinae <input type="checkbox"/> Diprotodontid <input type="checkbox"/> Zaglossus <input type="checkbox"/> Flora <input type="checkbox"/> Yam <input type="checkbox"/> Red Lily <input type="checkbox"/> Pandanus	<input type="checkbox"/> <b>Avian</b> <input type="checkbox"/> Goose <input type="checkbox"/> Darter <input type="checkbox"/> Emu <input type="checkbox"/> Kookaburra <input type="checkbox"/> Brolga <input type="checkbox"/> Kite/Eagle <input type="checkbox"/> Tracks <input type="checkbox"/> Macropod Track <input type="checkbox"/> Bird Track
<input type="checkbox"/> <b>Anthropomorph</b> <input type="checkbox"/> Human <input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Sorcery <input type="checkbox"/> Sexuality <input type="checkbox"/> Ceremony <input type="checkbox"/> Fighting <input type="checkbox"/> Hunting <input type="checkbox"/> Geometric Design	<input type="checkbox"/> <b>Material Culture</b> <input type="checkbox"/> Armlets <input type="checkbox"/> Neckbands <input type="checkbox"/> Head Dress <input type="checkbox"/> Aprons <input type="checkbox"/> Bag <input type="checkbox"/> Didjeridu <input type="checkbox"/> Fan <input type="checkbox"/> Canoe	<input type="checkbox"/> <b>Spears</b> <input type="checkbox"/> Hook Biserrial Spear <input type="checkbox"/> Hook Uniserrial Spear <input type="checkbox"/> Shovelnose Spear <input type="checkbox"/> Simple Spear <input type="checkbox"/> Multibarbed Spear <input type="checkbox"/> Goose Spear <input style="width: 100px; height: 20px;" type="text"/> Other	<input type="checkbox"/> <b>Weapons</b> <input type="checkbox"/> Fighting Pick <input type="checkbox"/> Boomerang <input type="checkbox"/> Stone Tool <input type="checkbox"/> Stone Axe <input type="checkbox"/> Spear Thrower	<input type="checkbox"/> <b>Contact</b> <input type="checkbox"/> European <input type="checkbox"/> Horse <input type="checkbox"/> Buffalo <input type="checkbox"/> Pig <input type="checkbox"/> Alphabet <input type="checkbox"/> Pipe <input type="checkbox"/> Structure <input type="checkbox"/> Object	<input type="checkbox"/> <b>Guns</b> <input type="checkbox"/> Martini-Henry Rifle <input type="checkbox"/> Revolver <input type="checkbox"/> Muzzle Load Rifle <input type="checkbox"/> Muzzle Load Pistol <input type="checkbox"/> Ships <input type="checkbox"/> Luggie <input type="checkbox"/> Perahu <input type="checkbox"/> Barge <input type="checkbox"/> 19thC <input type="checkbox"/> Steam <input type="checkbox"/> 20thC <input type="checkbox"/> Sail
<b>ROCK ART DENSITIES</b> <input type="checkbox"/> <5 <input type="checkbox"/> 5-10 <input type="checkbox"/> 10-20 <input type="checkbox"/> 20-30 <input type="checkbox"/> 40-50 <input type="checkbox"/> +50 <input type="checkbox"/> +100 <div style="border: 1px solid black; height: 20px; width: 100%;"></div> <div style="border: 1px solid black; height: 20px; width: 100%;"></div> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>					
<b>SITE CONDITION</b> <b>Overall Condition</b> <input type="checkbox"/> Good <input type="checkbox"/> Fair <input type="checkbox"/> Poor <b>Human Impacts</b> <input type="checkbox"/> Yes <input type="checkbox"/> No <b>Weathering</b> <input type="checkbox"/> Faded/Worn <input type="checkbox"/> Moss/Lichen <input type="checkbox"/> Cracked <input type="checkbox"/> Exfoliated <input type="checkbox"/> Iron Oxide Stain <input type="checkbox"/> Mineral Deposit <input type="checkbox"/> Water Erosion <input type="checkbox"/> Fire Damage <input type="checkbox"/> Trees <input type="checkbox"/> Vines <input type="checkbox"/> Grasses <b>Animal Impacts</b> <input type="checkbox"/> Mud Wasp <input type="checkbox"/> Termite <input type="checkbox"/> Ant <input type="checkbox"/> Wallows <input type="checkbox"/> Animal Rubbing <input type="checkbox"/> Animal Disturbance <b>Cyclone Damage</b> _____					
<b>SITE PLAN</b>  <div style="text-align: center;">             N  </div>			<b>SITE PROFILE</b>  		

Figure 9: Page 2 of site recording form used in the rock art survey in the Wellington Ranges.

### 1.1.3. Site Excavation and Collection

The excavation technique utilised the well proven excavation, recording and sampling techniques as developed by Johnson (1979; 1980), Burke and Smith (2004), and Balme and Patterson (2006). Excavation forms utilised were those provided from the Burke and Smith (2004) appendices. In order to establish whether there was a longer and more extensive period of contact beyond 1650-1720 with South East Asian communities, excavations attempted to establish the general occupation sequence for the region with specific reference to establishing a post-contact material culture. Excavation was undertaken in a manner to conserve the sites according to their cultural heritage significance through the management of personnel via induction training to modify on-site behaviour and through the application of geotextile matting and other methods.

The research conducted test excavations of two Macassan archaeological sites (Malara and McPherson Point), and four major Indigenous rockshelter sites (Bald Rock 1 and 3, Malarrak 1 and 4). The excavation and mapping of areas at the Anuru Bay Macassan archaeological site was conducted to test issues regarding shell midden accumulation, recover further pottery sherds, and to collect samples for dating from Stoneline 17 which had provided Macknight with the original old radiocarbon dates. Magnetometer surveys of both Malara and McPherson Point were conducted to pinpoint subsurface features predicted to be associated with trepang processing (see Appendix A). Professor Campbell Macknight attended the 2010 field season at Anuru Bay. His contribution was significant in revisiting the Anuru Bay archaeological site 40 years after his fieldwork and assisted in identifying his taphonomy experiment of the Anuru Bay Macassan site from 1968.

Excavation squares were based on 1m<sup>2</sup> as the principal unit. In some cases this was divided into 50cm x 50cm units as necessary. Techniques involved excavation unit (XU) depth at 2cm intervals, sediment descriptions, Munsell chart colour identification of sediments, pH testing, selecting artefact and charcoal samples, end unit sketches, and stratigraphic drawing of pit walls (see Chapters 2 and 4). Depth of units was measured from a datum on each square. The level of the datum was recorded by either total station or dumpy level. All excavation units were weighed, screened through 6mm and 3mm sieves, bagged and labelled (see Chapter 4). Photographs were taken during and at the end of the completed excavation. Mapping of Malara (Anuru Bay A), McPherson Point (South Goulburn Island), and Malarrak 1 were undertaken with a total station. Maliwawa (Bald Rock 1 and 3) were mapped via baseline and tape measure.

#### **1.1.4. Lithic Assemblages**

Lithic technologies and typologies in Arnhem Land have been well documented (see Allen 1989; Allen and Barton 1989; Jones 1985; Hiscock 1999, 2011; Schrire 1982). A requirement for successful archaeological projects involves the accurate identification of archaeological materials as highlighted by Burke and Smith (2004). Since the identification of stone artefacts is basic to the accurate recognition and measurement of the archaeological record, it is imperative that people undertaking archaeological surveys be able to differentiate between natural objects and artefacts. Principles of artefact identification employed in this survey follow those recommended by Hiscock (1984), and Holdaway and Stern (2004). Other artefacts and implement types that have been identified in the region also included are characteristics as outlined by McCarthy (1976), Cundy (1989), Kamminga (1982) and Holdaway and Stern (2004).

### **1.1.5. Stone Raw Material Identification**

Certain stone raw materials are chosen over others for manufacture of stone tools (Hiscock and Mitchell 1993). The identification of these stone raw materials is an important factor in the recording of archaeological sites. Distinguishing between raw material types is useful in the interpretation of stone tool technologies and past Indigenous settlement and mobility patterns. Stone raw material types found in Arnhem Land can include basalt (Pellant 1992:202), chalcedony (Bishop et al. 2001:133; Pough 1988:270; Mottana et al. 1978:245), chert (Pough 1988:270; Mottana et al. 1978:245), hornfels (Pough 1988:35; Pellant 1992:218), mudstone (Pellant 1992:232), quartzite (Pough 1988:34), silcrete (Langford-Smith, 1978:3), siltstone (Pellant 1992:232; Langford-Smith, 1978:3) and quartz (Thorpe and Brown 1990:16).

### **1.1.6. Non-stone (Contact) Artefacts**

Non-Indigenous materials have long been recognised in Indigenous archaeological sites in Arnhem Land, but little research has been conducted beyond the reporting of these finds (Jones 1985; Hiscock 1993; Schrire 1981). Mitchell (1994a) and Clarke (1994) undertook a more detailed study of contact period artefact assemblages found at Indigenous archaeological sites. Figure 10 illustrates the range of contact materials that have been encountered by the author whilst documenting Indigenous archaeological sites in western Arnhem Land. Identifying and quantifying the contact artefact assemblages encountered in this research is therefore an important aspect of measuring the impact of culture contact. It is likely that evidence of culture contact and change should be able to be examined in the archaeological assemblages of study area.

Detailed descriptions of the types of artefacts found from the Northern Territory's early historic artefact assemblages (i.e. glass, porcelain, pottery and metal fragments) can be found in Allen (2008), Macknight (1969), McCarthy (1986), Mitchell (1994c) and Holmes (1991). Furthermore, Burke and Smith (2004) provide useful reference material for dating and identifying historic materials. Descriptions from these sources were utilised to identify and establish a chronological framework for culture contact materials. The cultural material identified in these studies includes glass bottles, ceramics, porcelain and earthenware of European and Asian origin along with a large variety of both domestic and industrial metal artefacts. McCarthy (1988), Mitchell (1994c) and Macknight (1969) documented artefacts associated with historic mining sites and Macassan trepang processing sites in the Northern Territory. Glass artefact assemblages originate mostly from alcohol bottles used to contain beer, wine and spirits. Porcelain and stoneware artefacts are mostly of both European and Chinese origin consisting of rice bowls and large stoneware vessels (Austral Archaeology 1993:116; Clark 2011:408; Macknight 1969). Metal objects include tools (i.e. axe, hatchet, adze), cutlery, nails, fish hooks, brass plates, locks, hinges, containers, sheeting fragments, tin containers, items associated with horse and harness, and firearms and ammunition (Austral Archaeology 1993:116; Clark 2011; Macknight 1969; Mitchell 1994c). In an Indigenous archaeological context, many of these historic artefacts form the basis of raw materials that are adapted for different uses revealing the adaptive nature of Indigenous technological approaches (see Chapter 4).



Awunbarna: Contact artefact materials (collated by tourist operator) includes utilised metal, glass, ceramic fragments, clay pipe fragments, nails, and wire



Site MK-DG029: Utilised retouched glass flake from Mikinj Valley



Site MK-DG058: Table spoon with "TALLYHO" stamped on stem



Kakadu National Park: Iron hatchet with spinifex resin for traditional hafting



Site WMKDG012: Kettle found in Mikinj Valley rockshelter



Site KQ5: Disused flour tin cut in half in hearth area of shelter floor

**Figure 10: Examples of contact phase artefacts from rockshelters in Arnhem Land (D. Wesley)**



### 1.1.7. Shell Species Identification

As the study area is located within the Arnhem Land coastal biogeographic zone, it was predicted that marine shell would be encountered at Indigenous archaeological sites. Shell species consumed by Indigenous societies in the past in the Northern Territory can be diverse and abundant (Meehan 1982). Meehan (1982) identified up to 22 different species of bivalves alone consumed at the Anbarra mounds near Maningrida. Archaeological evidence of marine exploitation is generally found in open shell middens and shell scatters commonly found in coastal areas of northern Australia, or shell midden deposits formed in rockshelters (Allen 1989; Bourke 2000; Clarke 1994; Faulkner 2009, 2013; Hiscock 1997, 1999; Kamminga and Allen 1973; Mitchell 1994a; Roberts 1994; Schrire 1982). As shell taxa occur naturally in the environment, it is important to be able to identify and distinguish between natural occurrences of shell and those of anthropogenic origin in an archaeological context (and those created in the recent past by both Aboriginal and non-Aboriginal people). The following diagnostic characteristics apply to identifying shell middens and deposits in Table 4 (after Burke and Smith 2004:232).

**Table 4: Natural and cultural characteristics of shell middens, scatters and natural shell beds diagnostics (Burke and Smith 2004).**

Characteristics of an archaeological shell midden or scatter	Characteristics of a natural shell bed
Should contain a greater proportion of edible species.	May contain a mix of edible and inedible species.
Should contain a smaller proportion of articulated shell.	Should contain a proportion of articulated shell.
May contain artefacts.	Will not contain artefacts.
May contain bones of vertebrates used for food.	
May contain evidence of fire or burnt rocks that have been moved from the original source (i.e. oyster rocks).	Should contain a greater proportion of marine life not used as food (i.e. corals).

**Table 5 lists the most frequently occurring shell species that have been identified in archaeological assemblages in northern Australia.**

Name	Family	Species*	Habitat*	Major Archaeological References
Granular Mud Ark	<i>Arcidae</i>	<i>Anadara granosa</i>	Mud, associated with mangroves, in intertidal zone	Bourke (2000); Faulkner (2009); Hiscock (1997)
Oysters	<i>Ostreidae</i>	<i>Ostrea echinata</i> (aka <i>Saccostrea Cucculata</i> )	Rocks, intertidal zone	Bourke (2000)
Venus Cockles	<i>Veneridae</i>	<i>Tapes hiantina</i> <i>Marcia hiantina</i> <i>Tapes turgid</i>	Sand	Mitchell (1994a)
Horse Mussel	<i>Mytilidae</i>	<i>Modiolus</i> sp	Flat areas in intertidal zones	Clarke (1994)
Nerite	<i>Neritidae</i>	<i>Nerita</i> sp	Middle, upper intertidal zone on rocky shores	Faulkner (2013)
Murex	<i>Muricidae</i>	<i>Chicoreus</i> sp	On rocks in the intertidal zone	Bourke (2000)
Cockle	<i>Veneridae</i>	<i>Marcia hiantina</i>	Mangrove mud, 30 to 90 cm deep.	Mitchell (1994a)
Mud Creepers	<i>Potamididae</i>	<i>Telescopium</i> <i>Telescopium</i> <i>Terebralia semistriata</i> <i>Terebralia palustris</i> <i>Cerithidea obtuse</i>	Intertidal muddy habitats and mangroves	Bourke (2000)
Pearl Oysters	<i>Pteriidae</i>	<i>Pinctada</i> sp	Rocky substrate of intertidal zone to depths up to 30m	Mitchell (1994a)
Mud Cockle	<i>Corbiculidae</i>	<i>Polymesoda erosa</i> (aka: <i>Geloina coaxans</i> )	Muds on inshore fringes of mangrove forests	Bourke (2000)
Pugilina	<i>Melongenidae</i>	<i>Volema cochlidium</i>	Sand and mud, shallow water	Bourke (2000); Faulkner (2013)

\* (Willan and Dredge 2004)

### 1.1.8. Radiocarbon Dating

The project sought to establish a chronology of occupation in the region. Macassan and Indigenous coastal archaeological sites sampled to establish timings and changes in Macassan occupation in Indigenous mobility and resource utilisation activity included Malara (Anuru Bay A) and McPherson Point (South Goulburn Island) (see Chapter 2 and Appendix F). Indigenous rockshelters sampled for radiocarbon dating included Malarrak 1, Malarrak 4, and Bald Rock 1 (see Chapter 4). Radiocarbon dating samples were also taken from the two burial sites previously excavated by Macknight (1969) (see Appendix F). These sites were sampled in order to establish the chronological sequence of culture contact in the study area. Malarrak sites 1 and 4 are located more than 12km from the coast and the charcoal is highly unlikely to be from mangrove wood and more likely to be from dominant species of the coastal woodlands *Eucalytus tetradonta* or *E. miniata*. This reduces the likelihood of encountering issues such as the old wood problem identified by Macknight (1976) (see Chapter 2 and 4). Further radiocarbon dating was undertaken of beeswax motifs at the Djulirri rockshelter to date contact period motifs (see Appendix D). The site is close enough to the coast to contain an abundance of marine shell that could also be utilised for radiocarbon dating if necessary. At Malara (Anuru Bay A) shell-charcoal pairs were collected for dating. Marine shell-charcoal pairs were collected from both archaeological sites for radiometric dating to improve calibration and therefore improve the success of reliably dating the extent of the Macassan trepang industry in north western Arnhem Land which has hitherto been largely not documented (Ulm 2006).

### 1.1.9. Rock Art

It is important to note that approaches in Australian rock art research have mirrored those resulting from the introduction of processualism in Australian archaeology. The emphasis in rock art research has shifted to attempting to understand:

- The integrating function of art in Aboriginal society.
- How a range of social and economic information is encoded in art and its distributional characteristics.
- How it may reflect fundamental changes in social organisation, group interaction and land use.

These types of investigations required information on the cultural and natural contexts of rock art production whereas previous studies had tended to be more focused on rock art in isolation.

Important steps in the development of current perspectives on the study of Indigenous rock art were taken by Maynard (1977) and Clegg (1983). These archaeologists developed a more analytical approach to the study of rock art. Maynard (1977) contended that meaning is always highly specific and usually esoteric and as such is probably completely intractable. Clegg (1983) extended this position to argue against attempting to reconstruct the meaning of motifs on the grounds that it is impossible to securely ascertain either the subject or motivation of the artist.

There are generally two main types of rock art (Clegg 1983):

- Engravings and poundings where the pattern depicted is one of relief and pictures were apparently produced by removing material from the rock surface.
- Drawings, stencils and paintings where the material was added to the rock surface.

Common rock art terms used in this thesis include:

- Anthropomorph: A figure of a human form.
- Figurative Art: Art motifs which resemble objects familiar to the observer, representational or naturalistic art.
- Motif: A very common word used in describing rock art. This is usually defined as a recurrent visual image which has a particular arrangement (Maynard 1977). A mark or combination of marks of human origin, which can reasonably be interpreted to have formed an individual or separate picture, or design or a recurrent type of figure.
- Petroglyph: A mark or picture made on rock through the process of pecking, pounding, abrading or scratching the rock surface.
- X-ray Art: A style of rock art in which the internal skeleton and internal organs of humans or animals are depicted.
- Zoomorph: A figure of animal form.
- Stencils: Where paint has been applied over an object placed against the shelter wall. Most commonly found in the form of hand stencils, however many examples of items of material culture have been documented.

- Beeswax Figures: Where beeswax has been modified and placed on shelter walls to form an image.
- Superimposition: When multiple motifs are executed over one another at different times in the past.

An examination of stylistic representations and sequences were undertaken to compare with those of the greater Arnhem Land region (i.e. Chaloupka 1985, 1993; Taçon and Chippendale 1994). Rosenfeld and Smith (1997:407) note that using style can be problematic when applied as a chronological framework in rock art analysis. However, Rosenfeld and Smith (1997:407) state that despite limitations, style can provide value if there is a rigorous system of applying context to the research. According to Chippendale and Taçon (1998:90) there is a strong framework provided for identifying and dating the long tradition of rock art in western Arnhem Land. Chaloupka (1985, 1993) has defined various rock art styles and grouped them into art periods and phases for the west Arnhem region. By relating the known climatological, geomorphological, archaeological, historical, zoological and botanical data, Chaloupka (1985, 1993) developed a chronology for the rock art of Arnhem Land. Evidence of weathering, chemical changes in the rock surfaces and pigments, and the order in which paintings are apparently superimposed at particular sites also contributed to this process. According to Chaloupka (1985, 1993) the key to major stylistic changes lies in significant environmental changes, particularly sea level fluctuations experienced in the region during the late Pleistocene and Holocene. On this basis he proposed four main chronological periods for the classification of rock art in the west Arnhem region. Below is a summary of the major artistic stylistic

periods that have been identified by Chaloupka (1985, 1993) and further described by Chippendale and Taçon (1998):

- **Pre-estuarine Period** (before 8,000 BP). The Estuarine Period may be as old as 20,000 BP and up to 50,000 BP. Chaloupka (1983) inferred that the hunting weapons depicted in the art such as boomerangs could have been effectively used only in the grasslands and low woodlands that predominated in Kakadu at that time. Extinct faunal species from the late Pleistocene are also used as evidence for this time frame. The Pre-estuarine Period contained a number of different styles. The earliest of these consisted of prints of hands, grass and other objects. These were followed by paintings of naturalistic figures including macropod and extinct fauna, dynamic figures, post-dynamic figures and yam figures. Weapons such as spears are clearly illustrated in the art. Chaloupka considers the main body of art from this time period to be dated between 20,000 BP to 8,000 BP. Chaloupka argued that the changing art of the late Pre-estuarine Period reflected changing times for the Aboriginal people.
- **Estuarine Period** (8,000 BP to 1,500 BP). Chaloupka (1983) defined the Estuarine Period by relating the art to the changes occurring in floodplain conditions from 8,000 years ago and the subsequent changes in the nature of the resource base. Styles of the Estuarine Period are characterised by the appearance of animals, notably fish and a decline in the representations of emu and macropod. Depictions of hunters with a range of weapons documented the change in technology, which took place in response to the changing environment and resource availability.

The x-ray style of art developed and was continued in use up until the present.

- **Freshwater Period** (from 1,500 BP). The Freshwater Period is defined from 1,500 years ago with the appearance of large freshwater swamps and floodplains. Freshwater faunal and floral species were depicted such as Jabiru, water lilies and magpie geese. Different material culture was again developed and depicted to utilise the emerging resources.
- **Contact Period** (since Macassan and European contact 300 years ago). The final phase of the Contact Period from about 300 years ago differed only in the choice of the subject matter. According to Chippendale and Taçon (1998:95), European people and European objects have been known in Arnhem Land since early settlements on the Cobourg Peninsula some 160 years ago. Therefore depictions of items such as guns, ships, European persons and items, and introduced animals are datable from that period onwards (see Figure 11).

This is further expanded by Chippendale and Taçon (1998:107) who present a chronology of western Arnhem Land rock art based on Chaloupka's research, their own and others (Table 6). This chronology for identification of chronological phases for rock art in western Arnhem Land has been utilised in this research to avoid being restricted to environmental phases (Chippendale and Taçon 1998). Appendix E is an example of applying this system in relation to the discovery of the ancient bird stencil. Combining previous rock art research and models, the following definitions in Table 6 were used for assigning broad chronological rock art styles recorded in rock art sites in the study area.



**Table 5: Chronological periods assigned to rock art styles after Chippendale and Taçon's (1998:107) proposed chronology of Arnhem Land rock art.**

Period	Years Before Present	Styles
Pleistocene	>20,000 – 12,000 BP	3MF Stencils, Large Naturalistic, Hand Stencils, Engravings
Pleistocene-Holocene Transition	12,000 – 8,000 BP	Dynamic Figures, Post Dynamic Figures, Simple Figures with Boomerangs, Northern Running Figures
Mid Holocene	8,000 to 4,000 BP	Yam Figures, Large Fauna, Large Human, Simple Figures, Early X-Ray, Early Decorative Infill
Late Holocene	4,000 BP to Present	X-Ray, Complete Figure, Beeswax, Contact, Sorcery, Complex Decorative

The antiquity of contact period rock art was investigated through the documenting of the primary 'indicator' motifs of contact, i.e. ships, objects, foreigners and decorative elements to assist understanding the sequence of 'non-contact' motifs relating to the contact period (see Figure 11; Chapter 6; Appendices B, C, and D). Introduced imagery found in contact rock art in western Arnhem Land can include a high diversity of subjects of both Macassan and European origin including ships, European figures, material culture items such as eating implements, bottles, smoking pipes, tools, saddle bags, clothing, horses, buffalo, firearms, trucks, cars, bicycles and aircraft (see Figure 11). The details recorded included the documentation of the cross-cultural elements in the rock art assemblage and investigated the shift in the focus from a terrestrial to maritime landscape (David 2002; Cooney 2004). Determining the presence and absence of rock art styles has been assisted by utilising advanced image enhancement techniques (i.e. D-Stretch) to search the rock art for images that cannot be seen by the naked eye (see Chapter 6, 7 and 8; Appendix D). To

some extent this can assist in militating against the possibility that time and taphonomic factors are solely responsible for such 'absences'. Copies of certain raw images were enhanced using colour saturation and contrast to achieve this end (c.f. David et al. 2001; Gunn and Whear 2007).

Figure 8 and 9 illustrate the rapid rock art site recording form adapted from the above frameworks for the documentation of rock art sites in the Wellington Range. These recording forms are also based on previous documentation of rock art sites by the author. The recording form is designed to provide a quick checklist of the major archaeological features of each site and the rock art traditions present. The form is designed to allow for a summary recording of each site and to provide future management and research decisions to be made according to the presence and absence of archaeological features.



Site KQ: Painting of a series of twin engine aircraft



Site Arrarra AS20: Possible Macassan material culture - a bottle (*labu*) and lime container



Site Arrarra AS21: Firearm, likely to be percussion cap musket



Canon Hill: Painting of a two masted lugger and a stencil of an European iron axe



Site NE Myra DG012: Painting of a horse and rider depicted with hat and pipe



Site WMKDG012: painting of horse riding boots with stirrups

Figure 11: Examples of contact phase rock art (D. Wesley).

## 1.2. THESIS STRUCTURE

### 1.2.1. Chapter 2: Re-evaluating the timing of the Indonesian Trepang Industry in North West Arnhem Land: Chronological investigations at Malara (Anuru Bay A). Daryl Wesley, Sue O'Connor, Jack Fenner

A primary aim of this thesis is to investigate the two models of chronological contact with South East Asia—Macknight's (2008, 2013) short model, or McIntosh's (1996a, 1996b, 2006, 2008, 2011, 2013) long model. The Malara (Anuru Bay A) Macassan trepang processing site provided an excellent location to revisit the radiocarbon dating of the Macassan trepang processing industry and the reasons behind Macknight's (1969, 1976) original anomalous radiocarbon dates. It was also important to establish data which may or may not corroborate the findings from radiocarbon dating of beeswax pellets over the top of depictions of Macassan-like praus in the nearby Djulirri rockshelter (Taçon et al. 2010) (see Appendix D). Taçon et al. (2010) found that the radiocarbon dating of the beeswax provided a *terminus ante quem* for the painting of a south east Asian prau- (or *perahu*) like ship which placed it within the early to mid-17<sup>th</sup> Century, well before the intensification of the trepang processing industry in north Australia.

Another important aspect regarding Anuru Bay is its geographical significance as described by Captain Phillip Parker King (1827). King (1827) noted that Goulburn Island, Anuru Bay and Wellington Range are all significant navigational points along the Arnhem Land coastline. As Cooney (2004:323) stated, there are many ways in which seas connect different places and coastal zones and highlighted that the significance of coastal navigation and contact has been an enduring theme in the archaeology of Atlantic Europe. Cooney (2004) also noted the significance of understanding terrestrial landscapes as

approached from the sea. From the sea, it is possible to see Malarrak (Black Rock), an outlier of the Wellington Range and the first notable mountain feature seen by King (1827), along the entire Arnhem Land coast. King (1827) attempted to establish a trigonometry station on the beach of South Goulburn Island to definitively locate the area according to latitude and longitude. Despite many other islands and embayments encountered by King (1827) on his voyage along the Arnhem Land coast, it was this place above all that was so navigationally significant; he defied the Admiralty's standing orders not to land in hostile areas and risked the safety of his ship and crew to establish this trigonometry station. It is this navigational geographic anomaly that makes Anuru Bay a place of high potential for repeated landfall by any earlier mariners approaching the north western Arnhem Land coast. For this reason, the Malara (Anuru Bay A) trepang processing site warranted further archaeological re-assessment in case there may be evidence of earlier non-trepang processing occupation for South East Asian maritime resource exploitation.

Therefore this publication sets the temporal scene for the thesis discussions in the following chapters regarding pre- and post-Macassan culture contact. This chapter looks at a series of radiocarbon dates from Malara (Anuru Bay A) and demonstrates the probabilities for occupation of the site by South East Asians and Macassans. It then sets up the implications of these dates for culture contact in western Arnhem Land.

**1.2.2. Chapter 3. Earthenware of Anuru Bay: A Reassessment of Potsherds from a Macassan Trepang Processing Site, Arnhem Land, Australia and Implications for Macassan Trade and Trepang Industry. Daryl Wesley, Tristen Jones, Sue O'Connor, Jack Fenner and William R. Dickinson**

The purpose of this chapter is to establish whether there was supporting material culture evidence for the radiocarbon dating assessment of Malara (Anuru Bay A). Macassan trepang fleets were either entirely provisioning from the port of Makassar, or potentially collecting earthenware en route on the voyage to Australia. The earthenware assemblage from Malara (Anuru Bay A) may provide some insight into the diversity of sources of the earthenware procured by the trepangers, and also maritime and trading links with other areas in the Indonesian island archipelago. These are important considerations when discussing culture contact between Indigenous people of the Anuru Bay region and Indonesian seafarers.

**1.2.3. Chapter 4. "Small, Individually Nondescript, and Easily Overlooked": The significance of contact beads from rockshelters in the Wellington Range, north western Arnhem Land. Daryl Wesley and Mirani Litster**

Earlier in the introduction it was shown that researchers have stated there is probably a lack of, or no evidence for, Indigenous agency in the interactions between Macassans and Indigenous people during the trepang industry. Russell (2005:45) goes so far as to state that 'In the absence of unambiguous trade goods (such as glass beads) we are greatly hampered in studying the impact of contact on Australian Aboriginal culture.' This paper describes the glass beads recovered from the rockshelter excavations in the Wellington Range located near the Malara (Anuru Bay A) trepang processing site.

There is a long list of items that are noted to have been acquired by Indigenous groups from the Macassans, and this has been interpreted by some as a one

way process. This chapter describes the beads, the archaeological contexts that the beads were found in, and then discusses the implications for the Indigenous relationships between Macassans and Europeans with reference to the Indigenous hybrid economy model developed by Altman (2001).

**1.2.4. Chapter 5. Pigment geochemistry as chronological marker: The case of lead pigment in rock art in the Urrmarning 'Red Lily Lagoon' rock art precinct, western Arnhem Land. Daryl Wesley, Tristen Jones and Christian Reepmeyer**

In order to assess changes that may have occurred in the rock art assemblage, an important focus in documenting rock art in western Arnhem Land is the temporal and spatial characteristics of stylistic sequences present in Arnhem Land. By utilising rock art as Indigenous visual literature, it may be possible to construct a more detailed history of the fugitive aspects of the culture contact period. This chapter describes the methodology behind the application of pXRF to investigate rock art motifs and in characterizing rock art pigment geochemistry as potential for analysing possible diversity of pigment sources in the Red Lily Lagoon precinct to the south of the Wellington Ranges. It is evident in Arnhem Land that traditional (i.e. x-ray, Freshwater Period) Indigenous motifs occur alongside introduced subject contact objects painted in the same manner. The pXRF method has proven successful at identifying introduced modern pigments in the painting of 'customary' or 'traditional' imagery, thereby providing a method to assign customary imagery to the contact period. The discovery of the use of lead as a pigment source brings the focus again back to investigating interactions during the contact period and the economic vectors (i.e. mission, buffalo shooting, trepang fishing) that such a pigment source may come into Indigenous usage.

**1.2.5. Chapter 6. Sails Set in Stone: A Technological Analysis of Non-Indigenous Watercraft Rock Art Paintings in North Western Arnhem Land. Daryl Wesley, Jennifer McKinnon, and Jason T. Raupp**

Rock art sequences in the Wellington Range hold valuable information about the period of culture contact, beyond simple depictions of ships, foreigners and their material culture (Chaloupka 1993, 1996). Systems of art production underpin transformations occurring in Indigenous society during the ensuing culture contact period. A complex history of identity and reimagining is interwoven with these rock art images. Through an examination of the depictions of maritime vessels in the Wellington Range contact rock art, it may be possible to develop an understanding of the Indigenous perspective and involvement in this maritime economy. This chapter sets out to provide a reliable methodology through a maritime technological framework for identifying maritime vessels in rock art and the reasons why such depictions of vessels can be considered to be an Indigenous narrative of culture contact experience, not just reporting on something that is 'different'. Maritime activity was a significant part of the culture contact experience for Indigenous people in north western Arnhem Land and it would be expected that this may be reflected in the artistic traditions. It also identifies the possible transference of Indigenous traditions of painting to the production of introduced imagery such as ships. This paper also discusses the mechanisms for the interaction between Indigenous people in north western Arnhem Land and the various maritime economies that occurred in the region.



### **1.2.6. Chapter 7. Firearms in rock art of Arnhem Land, Northern Territory. Daryl Wesley**

This chapter presents an analysis of fourteen firearm rock art paintings from eight archaeological sites in Arnhem Land. The principle aims of this chapter are to present a technological approach to the identification of firearm paintings in order to demonstrate that Indigenous communities experienced firearms in a variety of ways, progressing from early conflict through to ownership during the buffalo shooting industry. Importantly the hybrid economy model provides an explanatory framework in which to understand the changing role of firearms. Finally, firearm paintings reveal Indigenous perceptions of introduced technology and can inform on changes in settlement and mobility post-contact.

### **1.2.7. Chapter 8. An End to Contact Imagery in Indigenous Rock Art, Arnhem Land. Daryl Wesley**

Wellington Range rock art can be positioned within the general corpus of western Arnhem Land rock art into the phases previously identified by Chaloupka (1993). Rockshelters in the Wellington Range contain a complex sequence of rock art from at least 15,000 years ago to the mid-20th Century. Several of these early-mid 20<sup>th</sup> Century motifs are of particular significance when analysing the decline of contact rock art production in western Arnhem Land. This chapter centres the discussion of this decline on two motifs in particular, a warship and an aircraft, and where these motifs fit within the history of Indigenous people of western Arnhem Land. Although there are a number of anecdotal examples of rock art production in western Arnhem Land through to the late 20<sup>th</sup> Century the paintings described tend to be of customary or traditional subjects i.e. kangaroos, fish, and anthropomorphic figures. The painting of non-traditional subject matter, i.e. cars, trucks, aircraft, houses etc. ceased. This chapter presents a case that at some stage during the 20<sup>th</sup>

Century European goods and society became part of normative life for Indigenous people in western Arnhem Land, and suggests that this may go some way towards explaining the transition in motif composition.

#### **1.2.8. Chapter 9. Conclusion**

The final chapter links the results and discussions in the thesis and presents a model of culture contact for western Arnhem Land. This model is significantly grounded in the hybrid economy model (Altman 2001, 2006, 2007). The Indigenous archaeological record becomes fundamentally altered after contact with outsiders. The level of this change is in turn driven by the level of interaction Indigenous people choosing to extend into a hybrid economic situation. This chapter demonstrates that instead of being passive actors in the various industries and settlements that occurred in western Arnhem Land, Indigenous people made decisions about the level of their involvement with these new encounters. A five-stage temporal model for the archaeology of culture contact in western Arnhem Land is presented in this final chapter based on the hybrid economy approach.

**Earthenware of Anuru Bay: A Re-assessment of Potsherds from a Macassan Trepang Processing Site, Arnhem Land, Australia And Implications For Macassan Trade And Trepang Industry.**

Authors: Daryl Wesley, Tristen Jones, Sue O'Connor, Jack Fenner, and William R. Dickinson.

Publication: Australian Archaeology

Current Publication Status: Accepted for Publication 29 May 2014

Coordinated and conducted the excavation and survey of Malara, Anuru Bay A, Macassan trepang site for fieldwork 2008-2010. Collated the all excavated and survey data for further analysis. Undertook basic classification of the entire Malara earthenware assemblage. Took this dataset and other datasets from the temper and fabric analysis provided by other contributors (Jones and Dickinson) and composed the overall question, background research, site description, discussion, and conclusion of this research paper.

Signed: 

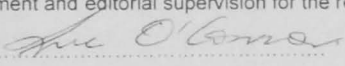
Mr. Daryl Wesley

Assisted with the fieldwork collection of earthenware from Anuru Bay and thin section cutting and preliminary sorting of potsherds from Areas A and B according to fabric type temper and type and provided a written assessment.

Signed: 

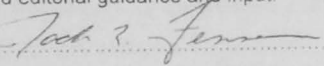
Ms. Tristen Jones

Australian Research Council Linkage Project LP0882985 Chief Investigator (CI) involved with assisting the coordination of fieldwork and participated in excavations at Malara, Anuru Bay A and continuing contribution to the ongoing project. As Project CI contributed to the topic development and editorial supervision for the research paper.

Signed: 

Professor Sue O'Connor

Assisted with mapping of the Malara, Anuru Bay A site during the 2009 and 2010 fieldwork seasons. Assisted with the development of the mapping data into maps for publication in this paper and editorial guidance and input.

Signed: 

Dr. Jack Fenner

Undertook the petrographic analysis of potsherd samples from Malara Anuru Bay A to confirm fabric and temper types and content. Also provided an assessment of the likely sources of the temper sands from Indonesia. Provided a short written assessment of the potsherd analysis incorporated into the temper and type analysis.

Signed: 

Dr. William R. Dickinson

*for Bill Dickinson. Dickinson is in the US but not available to sign - no e-mail contact.*

(i) Title Page

**Re-evaluating the timing of the Indonesian Trepang Industry in North West Arnhem Land: Chronological investigations at Malara (Anuru Bay A).**

Daryl Wesley (daryl.wesley@anu.edu.au)

Sue O'Connor (sue.oconnor@anu.edu.au)

Jack Fenner (jack.fenner@anu.edu.au)

Department of Archaeology and Natural History, School of Culture History and Language, College of Asia and the Pacific; Australian National University

**(ii) abstract and key words;**

**ABSTRACT**

Investigating the Malara (Anuru Bay A) Macassan trepang processing site was undertaken to test two different chronological models for the timing of culture contact in north western Arnhem Land with South East Asia. Currently the two chronological models are based on a long model of pre-Macassan and Macassan contact (> 200 years) and a short model of only Macassan contact (<120 years) with Indigenous people in north west Arnhem Land. The aim was to assess when the site was first occupied, when intensification of site use occurred, and later abandonment. This was undertaken through radiocarbon dating of Macassan trepang processing features, two burials, and other occupation areas. Bayesian analysis modelling of 18 radiocarbon dates provides an 80% probability the site was first occupied by Indonesian mariners circa AD 1637. This is followed by an intensification of trepang processing during the mid to late 18<sup>th</sup> Century consistent with the proliferation of the Macassan trepang trade economy. A final phase of site use occurs in the late 19<sup>th</sup> Century. We discuss issues regarding the 'old' radiocarbon dates from Macassan trepang processing sites. Combined with other archaeological evidence, the long culture contact model is supported by this study (Tacon et al. 2010).

**KEY WORDS**

Macassan, Makassar, trepang processing, Malara, Anuru Bay, Goulburn Island, Arnhem Land, Bayini, culture contact archaeology, radiocarbon dating, Bayesian, Maung, Wellington Range, stonelines, contact rock art, Northern Territory, Australia

## Introduction

Crucial to any archaeological discussion on societal change is the length of time in which such changes can occur between societies in contact. In our context, the answer to this question is largely dependent on when Macassans arrived in north western Arnhem Land. The question of when Macassan or other Indonesian mariners began to visit the shores of Anuru Bay is of significant consequence to discussion of Indigenous re-organisation of settlement strategies, economic exploitation, linguistic diversity, and residential mobility as reported by others (Berndt and Berndt 1949, 1952, 1954; Clarke 1994, 2000a, 2000b, 2002; Clarke and Frederick 2008, 2011; Evans 1992, 1997, 2002, 2009; Mitchell 1994, 1995, 1996; Russell 2004; Trudgen 2000; Warner 1932, 1937). For example, does change occur rapidly, or slowly, or can it be described more in terms of a series of punctuated equilibriums (c.f. Gould and Eldridge 1993; Loch and Huberman 1999; Romanelli and Tushman 1994; Sabherwal et al. 2001). The debate on the timing of culture contact with Indonesian mariners currently hinges on two particular models, the *short contact phase* model proposed by Macknight (2008, 2013) and the *long contact phase* model proposed by McIntosh (1996a, 1996b, 2006, 2008, 2011, 2013). These disparate chronological positions present a considerable problem in interpreting the Indigenous culture contact record in Arnhem Land. In this paper, we present recent archaeological results from the re-examination of the Anuru Bay trepang processing site previously investigated by Macknight (1969, 1976). The archaeological evidence will be presented to examine issues of chronology and change in association with Macassan trepang exploitation. These findings will then be compared against the results of investigations of nearby Indigenous rockshelter sites and rock art from the Wellington Range hinterland.

This research presents a chronological assessment of occupation and trepang processing by Macassans at Malara (Anuru Bay A), Arnhem Land, Northern Territory, Australia (Figure 1). Notably the new chronology presented here has implications for

the nature of contact between Indonesian mariners associated with shore-based trepang processing and the people of north-western Arnhem Land. The chronology is discussed through the optic of archaeology rather than history, by presenting new radiocarbon dates associated with a Macassan trepang processing site, in conjunction with a re-analysis of other investigations into Macassan interactions in north-western Arnhem Land. Macknight (1969, 1976) and Blair and Hall (2013:211) place Malara amongst the largest and most archaeologically significant trepang processing complexes in the Northern Territory. The history of the Macassan trepang industry has been extremely well documented by Macknight (1969, 1973, 1972, 1976, 1986, 2008, 2011, 2013) and has been further corroborated by other researchers of the trade history of Sulawesi and expansion of Macassan activities into eastern island Indonesia (Knapp 2006; Knaap and Sutherland 2004; Máñez and Ferse 2010; McWilliam 2007; McWilliam et al. 2012; O'Connor et al. 2012; Sutherland 2000).



**Figure 1** Malara (Anuru Bay A) and other archaeological sites in the Wellington Range, Arnhem Land (CartoGIS ANU).



**Figure 2.** Malara (Anuru Bay A) on a small chenier ridge built over a base of ferruginous sandstone (Photo D. Wesley)

### **Short Contact Model – Chinese/Macassan Trade and Trepang Industry**

*"The earliest records of the Macassan traders can be traced back to the 17th century... For over three hundred years they collected and processed sea slugs for trade with China."* National Gallery of Australia.

<http://nga.gov.au/federation/Detail.cfm?WorkID=65617>

The above statement is typical of what can be found in general public literature and interpretations regarding Macassan visitation to northern Australia. The National Gallery of Australia is not alone in claiming a period of 300 years, or more, of culture contact between Aboriginal Australians and Macassans via the trepang processing industry. However Macknight (2008; 2011; 2013) states that the proliferation of the trepang industry in Australia started no earlier than 1780 AD based on the historical evidence. It ceased in 1906-07 leaving a period of only 130 years of likely culture contact with Indigenous people in Arnhem Land. That would indicate that the changes identified by Macknight and others occurred in a very short time span indeed rather than the +300 years as stated above, giving rise to the *short contact model* or that the influence of Macassan trepang fishermen has been overstated in anthropological



studies in Arnhem Land. Culture-contact chronology is a significant issue when discussing change and impact arising from culture contact in Arnhem Land Indigenous societies.

Historical research informs us that the trepang industry was tethered to the complex south-east Asian economy driven by demand from China which allows specific historical dates to be applied to this particular industrial enterprise (Macknight 1976; Sutherland 2000; Sutherland and Knapp 2000). Expansion of the trepang industry in the 18<sup>th</sup> Century was based on the need to supply growing demand from China. The industry for the eastern Indonesian archipelago was centralized through the trading port of Makassar (Macknight 1976; Sutherland 2000; Sutherland and Knapp 2000) (Figure 3). The nature of the historic trepang industry in the Northern Territory has been extensively discussed by numerous researchers (Berndt and Berndt 1952, 1954; Clarke 1994, 2000; Ganter 2003, 2006; Macknight 1969, 1973, 1972, 1976, 1986, 2008, 2013; Mitchell 1994, 1996; Russell 2004; Spillett 1989; Trudgen 2000; Warner 1932, 1937). The basic description of the Macassan trepang voyage consists of a voyage to north Australia on the north west monsoon during the early wet season via other islands such as Timor (Clark 2011:400). The trepang harvest was undertaken during the tropical wet season, a time of storms, monsoon rain, and severe tropical cyclones. Fleets made for areas of the Arnhem Land coast, established base processing camps, and then split up to exploit various sections of the coastline. They returned to Makassar in the early dry season when the winds had shifted to the south east.



**Figure 3** Island South East Asia illustrating Macassan links to Australia (after Blair and Hall 2013:212; Knaap and Sutherland 2004; Morwood and Hobbs 1997:198; Russell 2004:8; Sutherland 2000) (map produced by CartoGIS ANU).

Some data on the size, frequency, and duration of the Macassan fleets that visited northern Australia is available from historical sources. Based on research by Mitchell (1994:36) there was a steady decline in the numbers of fleets and crew visiting the Northern Territory over the 19<sup>th</sup> Century. There are several implications that arise from this decline. Crew sizes from 1000 to 2000 Indonesian mariners during the first half of the 19<sup>th</sup> century have been reported and would have been a significant presence along the Arnhem Land coast and could perhaps account for the significant influence on Indigenous society. On the other hand, the Macassan trepang industry was prone to the fluctuations of commercial market demand and therefore contact with Aboriginal groups over the course of the 19<sup>th</sup> Century by nature would have been marked by punctuated bursts of intensity and been highly seasonally dependent. The arrival of Europeans on the Cobourg Peninsula was the beginning of the first long term, regular exposure of western Arnhem Land Indigenous society to outside cultural and economic influences.

## **Long Contact Model: Anthropological Assessments of Impact on Indigenous Society**

It has been well established that Macassans had a profound impact on coastal Indigenous Arnhem Land through the adoption of Macassan technologies and materials such as various tools, iron, glass, and the dugout canoe. These new technologies resulted in an intensification of the exploitation of marine resources, including turtle and dugong (c.f. Clarke 1994, 2000a, 2000b; Clarke and Frederick 2008; Mitchell 1994, 1996; Macknight 1976, 1986, 2008, 2013; McIntosh 1996a, 1996b, 2006, 2008, 2013; Spillett 1989; Thomson 1949, 1957). This is supported elsewhere in the Arnhem Land region with ample evidence of a trading relationship that led to changes in languages, travel to Makassar for a number of Aboriginal people, and the establishment of a trading network along the Australian coastline (Clarke 1994; Evans 1992, 1997, 2002, 2009; Harris 1985; McIntosh 1996a, 1996b, 2006, 2008; McConvell 1990; Morphy 1991, 1998; Spillett 1989). Morphy (1991; 1998) describes cultural change from Macassan interaction with Yolngu people as dynamic, with various social repercussions and a deeply influencing impact on art, ceremonial ritual, and song cycles in Eastern Arnhem Land. Thompson speculated that Yolngu trade and exchange was greatly influenced by Macassan culture contact and the introduction of the dugout canoe technology thus increasing residential mobility along the coastlines (Mitchell 1995). The timing of the occupation of Malara by Macassan trepang fishermen is critical to understand whether these changes occurred over a long period of time, or were very rapid.

According to Indigenous narratives recorded in Arnhem Land, the last 400 years is divided into a number of time periods based on culture contact beginning with a pre-Macassan time characterised by visitations from people referred to as the Bayini (Berndt and Berndt 1949, 1954, Macintosh 2006, 2008; Swain 1993). Although a number of researchers, Swain (1993), Macknight (1976, 2008), and Hiscock (2008) argue that 'Bajjini' is a modified Macassarese word, and the likelihood is that the Bayini are a transformation of recollections of Aboriginal people who saw, worked with,

and sometimes sailed with Macassans in the 18<sup>th</sup> and 19<sup>th</sup> Centuries. McIntosh (2006, 2008) disagrees.

McIntosh (2006, 2008) proposes from his anthropological research that there is a *long contact model* with Indonesian mariners who included the mythological Bayini or Pre-Macassans. McIntosh (2008) suggests that rather than the quest for trepang there may have been other economic, political, and social mechanisms that influenced maritime travel to northern Australia, and argues that Macassan trade routes throughout Indonesia were in existence from the AD 1500s. According to McIntosh (2006, 2008) there was a steady exchange of ideas and cultural beliefs as Indigenous communities worked and lived with the Bayini and Macassans. Oral tradition suggests ongoing visitation and exchange between the inhabitants of Arnhem Land and those from the Indonesian archipelago for a longer period beyond than that indicated by European or Asian historical records (McIntosh 1996; 2006, 2008). According to McIntosh (2006:162), it is possible to divide the phases of contact experienced by the Yolngu of eastern Arnhem Land. These different phases of contact are complex and resulted in vastly different social and economic outcomes for the Yolngu. The first phase of this contact with the Bayini is believed to have been in a "before Macassan" time and continue up to the present. These phases are briefly described in Table 1.

Furthermore, McIntosh (2006:155) has revealed a deep and intricate relationship between Macassans and Yolngu which centered on a place named Dholtji, a place that "honours a 'timeless' partnership that crosses international boundaries" in eastern Arnhem Land. The mythology of Dholtji indicates an *ancient* and on-going link to outsiders from the north visiting northern Australia (McIntosh 2006).

Table 1. Phases of contact with outsiders and the Yolngu compiled from ethnographic studies by McIntosh (2006)

Phase	Period	Outsiders	Description
1	Pre 1700s	Characterised by visits from the Bayini, Badu, or Wurrumula. Known as the whale and dugong hunters	First visitors not dissimilar to the Yolngu who carried out a trade with them. Established a reciprocal relationship that allowed Bayini to visit Arnhem Land.
2	1700s to early 1800	Characterised as the 'Golden Age' of contact and cooperation with the Macassan trepangers.	A period of cooperation and trade which saw the importation of foods, cloth, knives, metal, tobacco, ceramics. Yolngu would camp nearby Macassan trepang stations. A steady exchange of ideas and cultural beliefs. Yolngu work and live with Macassans.
3	Early 1800 to 1906	Characterised as the "Time of Fire" with relations between Macassans and Yolngu deteriorating. Influx of Europeans, i.e. British colonisers	A period of steady decline in relationships after the massacre at Dholitji. Practices non-conducive to cooperation i.e. prostitution of women, introduction of alcohol, violent quarrels. Some cooperation still occurred between Macassans and Yolngu in places. British colonisers begin to visit area and place controls on access. Yolngu reconsolidate to strengthen position in east Arnhem Land.
4.	1906 to present	Characterised as the Mission Time. Missions began in earnest in 1920s and 1930s in East Arnhem Land. World War II occurs and brings many servicemen into the region. Followed by mining in 1960s.	Yolngu begin to live at Mission settlements. Yolngu experience large social and economic changes from increasing influence from outsiders.

Clarke (2006b) is also an advocate for a longer chronology for contact. Although she (2000b:327) acknowledges historical accounts may be correct in dating the trepang industry to the mid-17th Century, she believes that it is "...possible that earlier visits involved smaller numbers of people and ships, and a different range of commodities such as sandalwood, pearl shell and turtle shell..." that may have been sought by other Indonesian island mariners. These anthropological assessments of the nature of culture contact are significant when evaluating the archaeological record of western Arnhem Land from this period. Whether such complex interactions with Macassan trepang fishing fleets and the influences noted by other researchers on Indigenous society can be detected in the archaeological record is of significant interest to archaeologists (Clarke 1994, 2000a, 2000b; Clarke and Frederick 2008; Clark and May 2013; May et al. 2010, May et al. 2011; Mitchell 1994, 1996; Taçon et al. 2010; Taçon et al. 2012; Theden-Ringl et al. 2011; Wesley et al. 2012).

## Which Model of Contact for North-West Arnhem Land?

A major issue in discussing the impact of culture contact in north western Arnhem Land is which model of contact is the most likely to have occurred, the long contact model or the short contact model of South East Asian visitation. This timing of contact is very relevant for discussing the considerable ability of Indigenous coastal communities in the Anuru Bay region to adapt and reorganise local economic and social strategies in response to culture contact generated from the Indonesian trepang industry and later European economies (May et al. 2010, May et al. 2011; Mitchell 1994, 1996; Taçon et al. 2010; Taçon et al. 2012; Theden-Ringl et al. 2011; Wesley 2013; Wesley et al. 2012). According to anthropological and historical literature, culture contact was seen to have fundamentally changed Arnhem Land Indigenous trade and exchange networks, introduced new technologies, changed traditional resource exploitation, influenced languages, social status, and was a major factor in producing a 'boom' social economy (Berndt and Berndt 1949, 1954; Clarke 1994, 2000; Evans 1992, 1997, 2002, 2009; Ganter 2003, 2006; Harris 1985; Lamilami 1974; Macknight 1969, 1973, 1972, 1976, 1986, 2008, 2013; McConvell 1990; Mitchell 1994, 1996; Mulvaney and Kamminga 1999; Russell 2004; Trudgen 2000; Warner 1932, 1937). Although the arrival of Europeans on the Cobourg Peninsula in 1827 begins to complicate any straight forward assessment of Macassan contact as the primary driver for cultural and economic change in western Arnhem Land, historical records indicate that direct European contact in the local Anuru Bay area was limited to temporary berthing of ships at South Goulburn Island during the 1880s, followed by intermittent penetration of transient buffalo shooting teams in the 1890s, and then the permanent establishment of a mission settlement in 1916 on South Goulburn Island (Berndt 1961; Wesley 2013; Wesley et al. 2012). It is also very likely the Maung speaking peoples of the area had travelled to and from the nearby European settlements of Fort Wellington and Port Essington between 1827 and 1849 as evidenced in the paintings of early 19<sup>th</sup> Century sailing ships in Djulirri and Malarrak (May et al. 2010; Wesley et al. 2012).

Berndt (1961:23) saw a divide between western and eastern Arnhem Land claiming that western Arnhem Land had been more directly affected by European contact and the east influenced by the Macassans. On the surface this seems to be a reasonable interpretation of Indigenous western Arnhem Land in the late 1940s. However this view is challenged by the archaeological research showing a sustained period of Macassan contact prior to European occupation, given the new chronologies presented at Malara and Djulirri in the west and the following significant overlap of both Macasan and European contact during the 19<sup>th</sup> Century (Mitchell 1994, 1996; Taçon et al. 2010; Taçon et al. 2012; Theden-Ringl et al. 2011; Wesley and Litster *in press*). Also in contrast to Berndt's (1961) assertion, during a visit to Goulburn Island in 1952, Axel Poignant encountered an old man (>70 years old) identified as Namaidjad who told him he had worked with the Macassans and had visited and returned from Sulawesi (National Library of Australia 5936/117). Namaidjad could sing Macassan songs such as 'hoisting the mast' song, 'pulling the line' song, and 'the rowing song'. He said there were two old men on Croker Island who also knew these songs (National Library of Australia 5936/117). Amongst other activities at the Mission, Poignant noted smoking tobacco in a Macassan pipe, wood carving of miniature prau and sailing boats, collecting sugarbag with iron hatchets, making Macassan style rope from local fibres, harpoons for hunting turtle and dugong, and sailing and canoeing around the islands in dug out canoes. These are all activities that have substantial origins from Macassan culture contact as witnessed by the Berndt's (1961) in eastern Arnhem Land.

Language research has illustrated Makassarese and Malay languages have had equally similar impacts on Iwaidja and Maung languages of the Cobourg Peninsula and Wellington Range as those of the Yolngu further east (Evans 1992, 1997, 2002, 2009; Harris 1985). Evans (2002) notes that the contact with Macassan trepang fishermen led to the sharing of around a hundred terms of Macassan origin across all the Iwaidjan languages such as *mijang* for 'Macassan prau' from Makassarese; *pamisseang* 'to row'; *binggu* 'adze for digging out dugout canoe' from Makassarese *bingkung*; *jimurru*

'east, north-east; easterly or north-easterly' from Makassarese *timoro* 'east wind'. It is also interesting to note that according to McConvell (1990:23) the oldest loan word in the Maung language is one for a bad skin condition or ailment; not one associated with ships, trepang processing, or trade goods. He infers this may be related to early contact that resulted in exposure to a number of different ailments which may have included smallpox, yaws and other diseases which would be consistent with first contact with early eastern Indonesian mariners (McConvell 1990:23). Furthermore, in 1952 Axel Poignant recorded the *Mirigbu* (seagull) ceremony for the Goulburn Island people, where the traditional totemic motifs of the Goulburn Island clan groups were incorporated into the body painting designs (National Library of Australia Collection 5936/99). These included a design for a sea-tree motif named *Bungabaju*. *Bungabaju* is a loanword from Makassarese for black sea coral. The significance here is the merging of a Makassarese loan word with an Indigenous customary totemic species that must reflect depth to both the cross-cultural relationship and possibly time supporting McConvell's (1990) theory of linguistic time depth. These linguistic adaptations support a model of long contact with eastern Indonesian mariners and subsequent participation with the trepang industry.

### **Previous Radiocarbon Dating of Macassan Trepang Processing Sites**

There are a number of issues surrounding the discussion of radiometric chronologies for Macassan archaeological sites in Northern Australia. The first concerns the number of radiocarbon dates from Macassan trepang processing sites. There are an estimated 101 recorded (potential) Macassan trepang processing sites (Northern Territory Government Archaeology Database) in the Northern Territory, of which only four have associated radiocarbon dates (Macknight 1969, 1976; Mitchell 1994). This presents a major impediment to establishing a chronology of the Macassan trepang industry in northern Australia.



Macknight (1969; 1976) undertook radiocarbon dating from three major trepang processing sites, Anuru Bay A, Lyäba (Groote Eylandt), and Entrance Island (See Table 2; Figure 4). His method for the collection of radiocarbon samples was sound; he sought out charcoal samples of relatively large sizes from hearth or charcoal rich lens contexts at the base of the excavations underneath the stonelines and not from within the actual rocks that make up the stoneline (Macknight 1969). Mitchell (1994) excavated two trepang processing stonelines at Barlambidj (also known as *Barlambij*), Copeland Island, located between the Cobourg Peninsula and Croker Island (Table 2; Figure 4). Mitchell (1997:27) described this trepang processing site as one of the largest and best preserved in western Arnhem Land, and therefore a good candidate to sample for radiocarbon dating. Mitchell (1994) took charcoal samples from excavations undertaken behind the stonelines and like Macknight, not from within the stoneline itself.



**Figure 4.** Locations of Macassan trepang processing sites and historical settlements mentioned in the text (CartoGIS ANU).

Table 2. Data on radiocarbon determinations and collection by Macknight (1969) and Mitchell (1994) from Macassan trepang processing sites in Arnhem Land

Site	Feature and Trench Location	<sup>14</sup> C Age BP (Uncalibrated)	Lab#	Cal AD*	Description of Sample Location	Source
Anuru Bay A	SL 2 (A/T/20 to A/T/20B)	125±57	ANU- 61	1797 - 1947	Charcoal sample taken from a charcoal lens from within a stoneline bay. Stoneline was in very good preservation.	Macknight 1969
Anuru Bay A	SL 7 (Square A/11.4/8.9)	500±75	ANU-316	1292 to 1522	Depth of deposit 25 cm, but deeper and very rich in charcoal towards the SE corner. Charcoal sample was collected at this point approximately at 30 cm below the surface. The sample was taken from a square excavated at the northern end of SL7	Macknight 1969
Anuru Bay A	SL 17 (A/25.6/8.6)	740±70	ANU-240	1155 to 1400	A sample of charcoal was collected from the south wall of excavation at a depth of 13-16 cm next to an unexcavated hearth.	Macknight 1969
Anuru Bay A	Cut mangrove stump	380±80	ANU-1295	1410 to 1664	A sample of wood was taken from a cut mangrove stump within 300m of the Anuru Bay A site.	Macknight 1976
North Beach, Entrance Island	SL 3	830±80	ANU-242	1030 to 1285	Sample of charcoal taken at approx. 45-50cm depth below the Macassan working floor area of the stoneline. Figure 5.9 clearly shows dark charcoal lens separated from above Macassan fireplace feature by sand stratum approx. 15cm width.	Macknight 1969
Lyäba, Groote Eylandt	SL 8 (8.9/9.3)	430±70	ANU-317	1398 to 1643	A charcoal sample was collected from a clearly defined fireplace on the northern side in front of SL8 approximately 20-25cm depth	Macknight 1969
Lyäba, Groote Eylandt	SL 13 (L/T/5)	780±75	ANU-241	1118 to 1311	On the south side of the SL is a well-defined fireplace extending 1m in front with a rich deposit of charcoal. A sample was collected from this deposit which in Sheet 6 section drawing is located below the Macassan working sediments approximately 25-30cm depth.	Macknight 1969

Site	Feature and Trench Location	<sup>14</sup> C Age BP (Uncalibrated)	Lab#	Cal AD*	Description of Sample Location	Source
Barlambidj	SL3 (SQ F)	100±10	BETA-41415	1812 to 1895	Charcoal sample of 44g consisting of pieces of narrow branches and twigs. Depth of 15cm in Spit 3 in Layer 2f, a dark charcoal lens with fine shell grit matrix and coarse sand. Recovered from Square F, again excavated from behind the stoneline.	Mitchell 1994:314
Barlambidj	SL4 (SQ E)	110±60	BETA-47217	1798 to 1945	Charcoal sample of 30.7 grams from an in situ collection from Layer 2d, a black charcoal lens of poorly sorted sand and coarse shell grit with lumps of charcoal up to 45mm in diameter. This lens was from Square E located behind the stoneline.	Mitchell 1994:316-323

\*SL = Stoneline

\* Calibration using Oxcal v4.2.3; 95.4% probability; IntCal09; 95% Probability > 60% Mean Confidence

MacKnight (1968; 1986; 1976, 2008, 2013) suggested that the three dates circa 1000AD to 1300AD (Table 2) are far too early to coincide with the historic documentation for Chinese trade with Sulawesi which was the impetus for the trepang industry. Other archaeological research in Sulawesi supports this interpretation of when Chinese trade began to occur with Makassar (c.f. Bulbeck 1989; Bulbeck and Clune 2003; Bulbeck and Rowley 2001). MacKnight (1968; 1976; 2008; 2013) also states that the material culture (e.g. earthenware pottery) found at the Macassan trepang processing sites that he studied can largely be attributed to the mid to late 18<sup>th</sup> Century. Finally, he has posited an 'old wood' problem to explain the apparent discrepancy between the dates he obtained at three archaeological sites along the Arnhem Land coast and the historic record (MacKnight 1976; Clarke 2000b:328). Clarke (2000b:327) states that a "...more rigorous program to test likely sources (of the problem) should be applied" and that MacKnight's investigation was inadequate. Clarke (2000b:328) further states:

*"There is no clear-cut answer to the discrepancy between the archaeological and documentary dates for Macassan contact... One date can be explained as a discrepancy, two dates may be a coincidence, but three dates would seem to form the basis of an argument; unless there really is a proven problem with old wood, the long archaeological chronology of Macassan contact is as likely as the short, documentary chronology."* (2000b:328)

Clarke (2000b:327) suggests Macassans or others may not have relied completely on the intensification of Chinese trade into Makassar. Ganter (2006:7) believes that the historical evidence "is far more brittle", or not robust in providing any data to support earlier visitations by South East Asian communities, hence the need for archaeological investigation of the phases of contact that may be reflected in the archaeological record in some manner

## ***Issues Regarding Old Radiocarbon Dates***

The majority of major Macassan trepang processing sites are located on foredune and foreshore areas of bays, open beaches, and islands. North Australian coastlines are notoriously volatile environments and subject to large changes in short periods or even single climatic events (i.e. cyclones). Therefore a significant issue to consider is that the earliest sites of South East Asian seafaring landfall are likely to be obscured by highly mobile sand sediments or even destroyed by cyclonic wave action and inundation. These factors significantly reduce the likelihood of discovery of archaeological sites that have an early chronological signature.

Another factor that has confounded radiometric dating of archaeological sites from the 17th to 19th Centuries includes the uncertainties in radiocarbon calibration during this period. Radiocarbon calibration curves are 'flat' during much of this period, resulting in large uncertainties of up to 100 to 200 years in calibrated dates (Reimer et al. 2013, Reimer and Reimer 2007). Furthermore, the calibrated date probability distributions are not smooth, but rather can have widely fluctuating likelihoods for dates only a few decades apart. This is not an enviable situation when dealing with decades rather than centuries or thousands of years as is the case in studying prehistory. In the case of determining the initial landfall by Macassan trepang fishermen at Arnhem Land sites it creates a major obstacle and decreases the confidence of the academy in radiometric techniques to answer questions of dating site occupation. However, despite the wide calibrated date ranges, it is proposed that radiocarbon determinations from this period can still be useful for providing an indicator, median, and trend of occupation as will be shown later in this paper.

A number of arguments have been presented on why dates from Macknight's studies (1969, 1976) are not reliable. Macknight himself (1969, 1976, 2008) suggested contamination although the samples were taken from very strong stratigraphic associations, and later discussed the possibility of old wood effect. Old wood problems

in radiocarbon determinations are known to be associated with rates of wood decay, accumulations of old wood in an environment, long-lived and decay resistant tree and plant species (Schiffer 1986). Macknight (1969:99) in his extensive research found a number of accounts that described Macassan preference for mangrove wood (*Rhizophora* sp.) as the preferred fuel for the trepang fire bays and smoking pits. Mangrove wood has historically been, and continues to be, utilized throughout the Asia-Pacific for traditional purposes such as timber, firewood, charcoal, building materials from houses to furniture, tannin, medicines, and resins (Ghosh 2011:57; Hauff et al. 2006:97; Kathiresan and Bingham 2001:105-106; Putz and Chan 1986:213). Mitchell (1994) discussed issues regarding technical problems with the radiocarbon analysis of burnt mangrove wood and suggested a number of issues that could produce an unreliable date, including an alleged marine reservoir effect. In contrast, Bourke and Hua (2009:184) believe the likelihood of an old wood effect in wood charcoal from shell midden sites at Hope Inlet, Northern Territory, is unlikely as the wet-dry tropics of north Australia are not known for old trees. Hua (2009:385) uses mangrove wood in studies of dendrochronology and post-bomb radiocarbon effects, citing no information that there are issues regarding marine reservoir or old wood effect in mangrove species. Whilst investigating archaeological burials in Oman, Zazzo et al. (2012:6) did find mangrove wood charcoal  $^{14}\text{C}$  age discrepancies of between 180 and 240 radiocarbon years. However, their analysis showed that mangroves (*Avecennia* sp.) lives only in the order of decades, not centuries. They concluded that in such an arid zone, wood is rare and would be re-used, and could be preserved for long periods of time (Zazzo et al. 2012). In their final analysis they concluded that the mangrove wood would not offer a marine reservoir error and that older charcoals from mangrove wood were present in the earth and were incorporated into the grave at the time of interment (Zazzo et al. 2012). The presence of older charcoals in the earth is an explanation we draw on later to explain the differences in radiocarbon age determinations across the Malara site.

It is also important to discuss here the evidence for the likelihood of 'old wood' from mangroves and other trees in tropical coastal woodlands of the Northern Territory. It is widely accepted that the carbon isotopes of wood charcoal, as described by Bednarik (2012:64), are an indication of the conditions at the time of integration of CO<sub>2</sub> from the atmosphere into the plant or tree when it was alive. Mangroves show characteristic C<sub>3</sub> photosynthesis (Kathiresan and Bingham 2001:104). Mangroves like other C<sub>3</sub> plants, produce sugars for tissue construction within their leaves via photosynthesis of CO<sub>2</sub> and water vapour in the atmosphere (Marshall et al. 2007). This immediately rules out marine reservoir effect for mangrove wood charcoal as during their lives the mangroves still exchange CO<sub>2</sub> from the atmosphere and not the ocean. The introduction of old carbon into archaeological sites is usually a problem known in arid or cold settings in which old wood or old charcoal can persist in the landscape for hundreds of years (Holdaway et al. 2005:45; Holliday 2004:182; Sheets 2002:7; Stein et al. 2003:312). It has also been shown that there are many vectors or agencies that can have an impact on the amount of carbon in materials found within archaeological contexts with the carbon origin being of the utmost importance (Olsen et al. 2013:31; Taylor 2005). These include the exchange of carbon pre-death of the organism, contamination, inbuilt age, old wood effect, site disturbances, exchange of old carbon from water soluble sources in archaeological sediments, marine or freshwater diets, and exchange of old wood carbon into burnt bone (Bednarik 2012; Olsen et al. 2013:31; Taylor 2005; Zazzo 2012).

Like terrestrial forests, mangrove forests can have highly variable growth rates depending on disturbance, harvesting, and coastal environmental factors (Alongi 2002; Blasco et al. 1996; Ghosh 2011; Hauff et al. 2006). Putz and Chan (1986:212) note that stands of mature *Rhizophora* sp. in Malaysia can live in excess of 80 years. Kathiresan and Bingham (2001:100) in their extensive review of mangrove biology, note only one mangrove species from Ecuador that is known to live greater than 100 years. Unlike their terrestrial counterparts, Kathiresan and Bingham (2001:166) also note that it is

difficult to use the term 'old growth forest' for mangrove forests owing to mangrove zonation, tidal variation, sedimentation, and erosion. Blasco et al. (1996:167) note that owing to the highly specialized environments mangroves occupy, mangrove mortality rates can be quite high owing to susceptibility to any minor variations in their hydrological or tidal regimes. Additionally tree-piping termites commonly found in the Northern Territory have been known to be a major cause of death of large mangrove trees (Werner and Prior 2007:611-612). Given climatic and geomorphological conditions of the Northern Territory coastlines and their propensity to change rapidly, mangrove forests would be expected to be not very long lived (Woodroffe 1988, 1993; Woodroffe and Grindrod 1991)

Unlike north-western America (Stein et al. 2003:312) where tree species are known to live up to 800 to 100 years, quantitative research on the age of terrestrial tree species in the Northern Territory is very limited. Initial estimates for tree age in open woodlands of wet-dry monsoon climates suggested they would not be long lived and that 200 years would rarely be achieved before being burnt or consumed by termites (Ogden 1981:409). Further research has revealed that some tree species have potential for old age. An example is the widespread and utilized termite resistant ironwood, *Erythrophleum chlorostachys* (Cook et al. 2005; Taylor et al. 2002; Woinarski et al. 2002a, 2002b). Taylor et al. (2002:124) estimate that a 40cm diameter *Erythrophleum chlorostachys* could possibly be as much as 367 years old. However in contrast to this example, a 41cm diameter ironwood tree was found growing through the wreckage of an old truck from 1962 providing a *terminus post quem* of at most 34 years old (Taylor et al. 2002:128). Therefore they concluded that differences in age relate to competition effects with trees growing slowly and ageing in mature savanna forest environments and trees growing rapidly in cleared areas (Taylor et al. 2002:128). According to Woinarski and Westaway (2008:1), growth rates in mature tropical savannah forests suggest that some tree species could be in excess of 250 years old. Further studies had also proposed that *Eucalyptus tetradonta* and *E. miniata* in established savanna



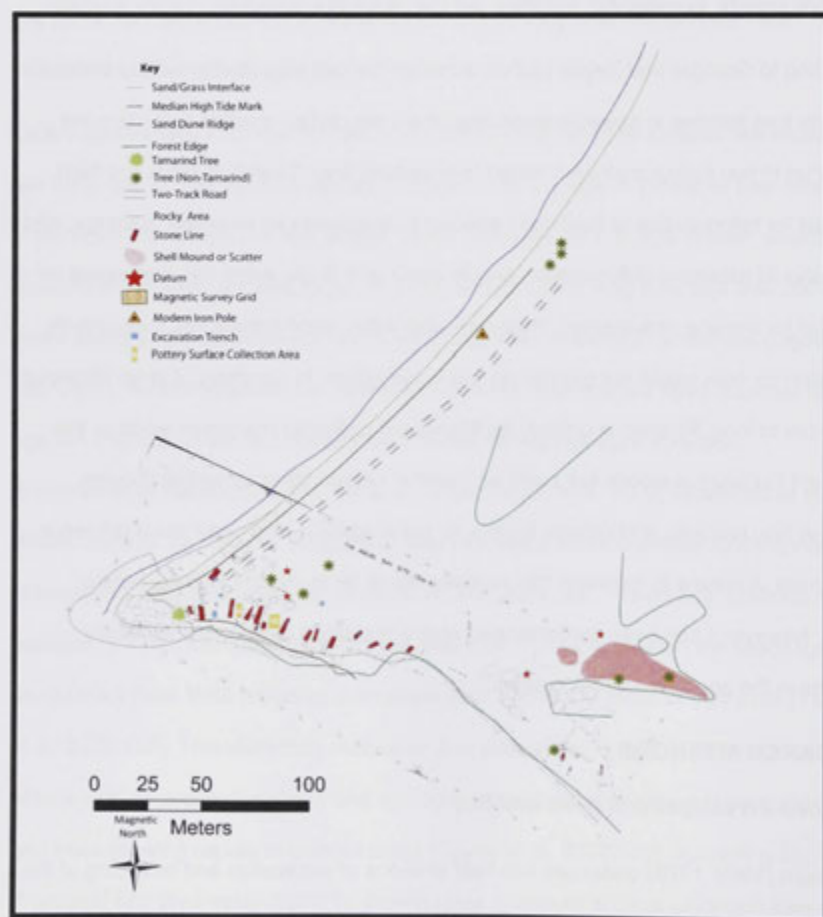
woodland are likely to be no older than 150 to 180 years (Woinarski and Westaway 2008:10). *Cycas armstrongii*, a common species in Northern Territory, grows at an average of 3.5 cm per year with estimates that a two metre tall plant is about 75 years old (Cowie et al. 2011). Other studies have shown that that termites can have a significant impact on two of the most common species of Eucalypts in savanna woodlands tree, *Eucalyptus tetrodonta* and *E. miniata*, and therefore affect tree survival and age (Werner and Prior 2007; Werner et al. 2008). N'Dri et al. (2014) demonstrate that the north Australian savanna woodland environment lacks large herbivores and therefore insects, in particular, termites, are the principal consumers of plant biomass. According to Granger and Taylor (2002), although fire can suppress growth of certain Eucalypt tree species in savanna woodland, there are certain species that can grow rapidly up to two to four metres in height to withstand fires. Therefore there is a high potential for reforestation of hardwood species to rejuvenate as juveniles, saplings, and poles should extensive deforestation events occur in a single event (i.e. harvesting for firewood for trepang processing). Therefore after initial wood harvesting, new growth harvested for fires would not provide an 'old wood' effect. In summary, a large old wood effect due to long life span is unlikely for Macassan preferred mangrove wood or the dominant Eucalyptus woods but could be found in certain other terrestrial species, however fire, termites, and climate factors do not suggest a long dead wood presence in the area. A means to minimize this problem would be to identify species before dating, however it has been demonstrated above that there is still great variability possible in the age of the same species.

## RESEARCH METHODS

### *Previous Investigations at Anuru Bay*

Macknight (1969, 1976) undertook two field seasons of excavation and recording at the Anuru Bay A Macassan trepang processing site. He (1969) undertook an extensive ground surface survey and large scale area excavations to establish archaeological

features, recover material culture, and chronologically date the occupation. He (1969; 1976) subsequently identified the surface and subsurface features relating to the use of the site as a trepang processing centre made up of 21 stonelines used for the boiling of trepang, pits, and drying areas for processing trepang, and potential living or occupation floors (Figure 5). An extensive scatter of earthenware fragments including some rarer individual finds (i.e. iron and brass fragments, clay pipes, fishhooks) are amongst the general Macassan material culture documented at the site (Macknight 1969, 1976).



**Figure 5.** Malara (Anuru Bay A) showing archaeological features and areas of investigation in 2009–2010, with Macknight's (1969) map overlaid (map by Jack Fenner).

Macknight (1969:200-201) divided the site into two distinct areas, Area 1 which contained the major portion of the western part of the site, and Area 2 to the east which contained some slightly buried stonelines. Area 1 is the major area. It contained two burials of persons of Asian descent, stonelines 1 to 14, 20, and 21 and the subsurface features consisting of trepang burial pits and smokehouses (Macknight 1969:201; Theden-Ringl 2011). The stonelines as described by Macknight (1969:202) consist of low structures of stone with some of the stonelines containing intact cooking 'horseshoe' shaped bays numbering from 2 to 7 depending on the level of preservation at the time in 1967. Macknight (1969:202) suggests that the stone utilized to form the stonelines was collected from the local outcrops around the Anuru Bay area and our analysis confirms that this is the case.

### ***Project Aims***

Our project considered that Macknight (1969; 1976) had answered many of the questions regarding site use and material culture analysis with his thorough documentation and mapping. The excavation plans were designed to address specific questions but leave as much of the fabric of the site *in-situ* as possible. Specifically, the aim of this research was to re-examine Malara to recover dating samples from distinct working areas identified by Macknight (1969; 1976) rather than to uncover large scale areas again. A further proposition examined in this study was whether Macassans were possibly living onshore or on their boats at anchor, or careened at Anuru Bay. Macassans were historically noted to have lived on their vessels whilst undertaking the industrial processing onshore (Macknight 1976). Such questions included whether Macassans were involved in local provisioning during their exploitation of local resources and whether it was possible to measure the environmental impact of the industrial sized trepang processing operation. The methods chosen for this project were on a smaller less invasive scale than Macknight's earlier exploratory research. The desire to limit destructive techniques while identifying potential areas for intrusive

excavation led to the choice of geophysical techniques to choose excavation locations (see McKinnon et al. 2013). Geophysical survey of the Anuru Bay Macassan trepang site assisted in the discovery of sub-surface features without the need for large scale archaeological excavation at such a culturally significant site. Our method was also concerned with testing the current understanding of site formation and taphonomic processes relevant to site interpretation and collecting radiocarbon samples to resolve issues that arose from Macknight's (1976) earlier investigations. These aims were accomplished by using small-scale controlled archaeological excavation methods to recover in-situ materials from defined Macassan living floors or work areas (i.e. smoking pits, stonelines). Our sampling method employed excavation of squares with 2cm depth units and 6mm and 3mm screening of deposit to provide a level of control over the recovery of materials that would allow us to assess a range of questions regarding Macassan site use.

Charcoal samples for radiocarbon dating were selected using the following methodology and principles as outlined Bird (2007). Charcoal was sourced from trenches and stonelines where the stratigraphy exhibited limited post-depositional disturbance. Charcoal fragments particularly sought after were those that were attached to stones within the excavated stonelines or to ceramic pieces. Larger fragments of charcoal were selected in order that smaller samples would be left over for future analysis. Given the environmental context of the site in the wet-dry monsoon tropics with significant fluvial flows across the site in the wet season, angular fragments of charcoal as opposed to rounded fragments were selected. An important factor was also to obtain a number of dates from any one feature to check for potential errors such as post-depositional issues and mixing of charcoal and sediments. Charcoal was processed using AMS radiocarbon dating (Jull 2007).

Understanding site formation processes at Malara was a major issue for re-evaluating the chronology of site features (cf. Schiffer 1972; 1983). According to Allen and Morrison (2013:2) the sedimentary history, post-depositional influences, and

environmental context are critical to understand chronology and occupation activities at archaeological sites. Neuman (2005:264) has stated that unfavourable preservation in tropical soils, taphonomic factors, and site context can be responsible for the missing evidence, and in the case at Malara, suitable material for radiocarbon dating.

Particular issues encountered in northern Australian open archaeological sites such as shell middens and earth mounds include a wide variety of factors, from extreme weather events to burrowing animals (c.f. Bourke 2000; Brockwell 1989, 1996a, 1996b, 2001; Guse 2006; Mowat 1994, 1995). An important study undertaken by Gregory (1998) investigated in detail the taphonomic processes at work on archaeological sites in tropical northern Australia. Gregory (1998:123) found that a range of disturbance processes operate on archaeological sites, which include those associated with humans, animals, plant, wind, and water action. Overall, Gregory (1998:123) noted that fluvial action was primarily responsible for post-deposition disturbance. Gregory (1998:20) also found that the wet season inundation of northern Australia has a large impact on the representation of artefact size classes on open archaeological sites. Therefore sheet wash and inundation are likely to "substantially modify" open archaeological sites in north Australia (Gregory 1998:123).

## **MALARA: SUMMARY OF EXCAVATION RESULTS**

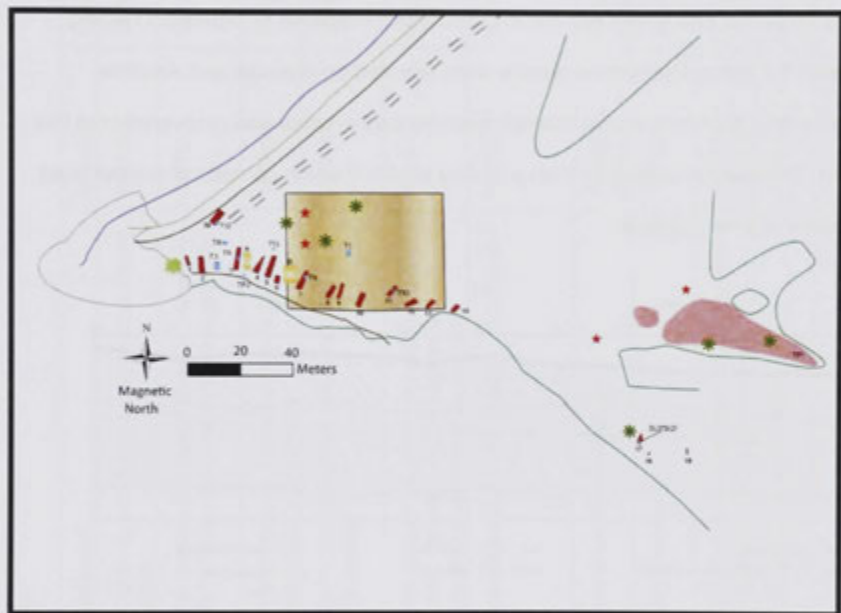
The site contains a total of 21 stonelines, some of which are now buried, with the majority aligned roughly north-south (Figure 5). The stonelines were formed as single lines of ferruginous sandstone rocks, with small bays protruding horizontally from the backbone of the stoneline. The area surrounding the stonelines contains a collection of earthenware potsherds, and a scatter of shell remains. The Anuru Bay site complex has degraded in condition since the 1968 excavations owing to modern recreational use and contains a moderate density of modern glass, rubbish, metal and organic debris. This disturbance is due to recent use of the area for recreational boating

access. The peninsula can also be subjected to extreme weather conditions during the monsoon season.

Stoneline features found at Malara between 2008 and 2010 had been significantly eroded and some were disrupted from feral pig diggings (*Sus scrofa*). As previously described by Macknight (1969) the stonelines are constructed from a local outcrop that the sandy Holocene beach ridge has formed over. The rock is from a notably different type of sandstone to that of the Mamadawerre Sandstone found in the nearby Wellington Ranges. The stone is from the Moonkinu Member consisting of very fine to fine sublabile ferruginous sandstone interbedded with grey carbonaceous siltstone and mudstone (Senior and Smart 1976). Macro inspection of the stoneline materials confirmed that the stones are composed of fine grained sandstone with variable high silt-mudstone matrix with a high ferrous content. Stones that formed parts of the stonelines were found to be highly variable in colour, with a range of orange to red, indicating that iron oxide discolouration in the stone may have been altered owing to firing from the trepang boiling processes (Alpers-Afil 2008; Domanski and Webb 1992; Mercieca and Hiscock, 2008; Purdy and Brooks 1971). Geophysical investigations at Malara have demonstrated that there had been excessive anthropogenic burning in the stoneline areas (McKinnon et al. 2013)(Figure 6).

A total of 13 trenches (consisting of 11m<sup>2</sup>) were excavated in field seasons from 2008 to 2010 which provided a range of data on the faunal and cultural artefact assemblages at the Anuru Bay site complex (Figure 6). Earthenware potsherds were recovered from surface collections and excavations with a total of 301 sherds (1.3kg). No fragments of glass, beads, metal, or ochre were recovered. Only two stone artefacts, a silcrete unifacial point and dolerite flake, were recovered from the excavations. The excavations produced a large quantity of economic shellfish species. The four most common bivalve shell species in the shell assemblage are *Anadara granosa*, *Attactodea striata*, *Tapes dorsatus* and *Palcuna lincolni*. Other bivalve species include *Anadara* sp., *Anadara gubernaculum*, *Acrosterigma* sp., *Placumen* sp., *Saccostrea* sp.,

*Dendrostrea* sp., *Lucinidae*, *Patella* sp. and at least two *Veneridae* species, one of which is most likely *Chama limbula*. The two most common gastropods are *Terebralia striata* and *Telescopium telescopium*. Other common gastropod species include at least three different *Nerita* species and fragments of *Melo* sp. (Baler) and *Syrinx aruanus*. Shell species diversity tended to be high in the Indigenous shell midden layers of the site found in Trench 1 (SU V), with shell species diversity much lower in the areas identified as Macassan trepang processing areas.



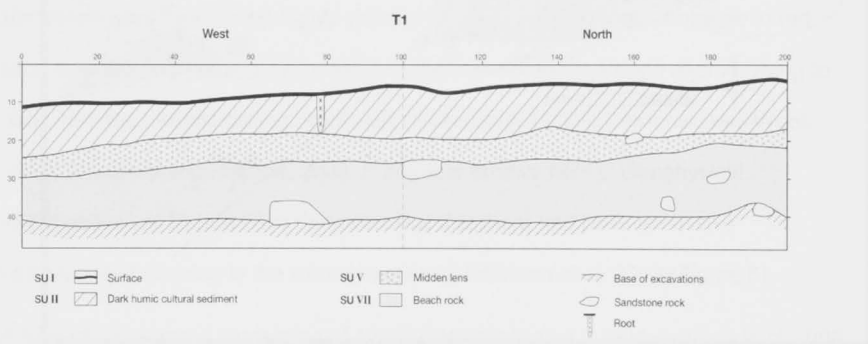
**Figure 6.** Malara illustrating stonelines, excavation trenches, and magnetometer survey area (see McKinnon et al. 2013) (Map by Jack Fenner)

Because of the importance of context for radiocarbon samples, we will briefly present the stratigraphy and sampling locations for each excavated trench. Stratigraphic Unit descriptions relevant for all excavated trenches across the site can be found in Table 3.

### Trench 1

As discussed in McKinnon et al. (2013), a trench was selected at a magnetic anomaly to investigate the sub-surface deposit in an area to the north of the majority of Macknight's (1969) excavations. Trench 1 contained Stratigraphic Units I, II, V, and VII.

A 10cm layer of Unit II covered a densely packed shell midden layer (V) immediately below the humic sediments (Figure 7). The midden layer continued for 20cm in depth and produced approximately 15kg of shell. This midden layer contained the highest diversity and abundance of shell species from all the trenches excavated at Anuru Bay. The shell material was highly burnt and friable with ashy lenses interspersed throughout the deposit. At the base of the shell midden layer was a heat retainer hearth feature comprising five claystone rocks. The stones were typical of local kaolinitic sandy claystone and were deep red in colour being indicative of significant heating. Samples for dating this midden feature were selected on charcoal and *Anadara granosa* from XU7 from a charcoal rich lens. No earthenware was recovered from this trench. The cultural sediments then give way to Unit V which consists of consolidated Holocene chenier material.



**Figure 7.** Section drawing for Trench 1 (CartoGIS ANU)



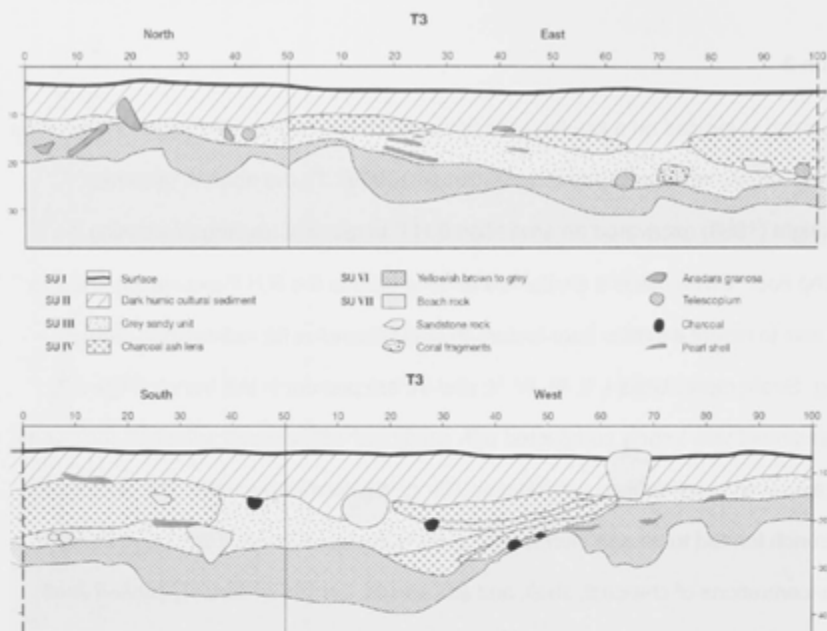
**Table 3. Malara (Anuru Bay A) Stratigraphic Units**

UNIT	Description	Sediment	Munsell	Colour	Trench
I	Thin veneer of sand on surface across site anywhere from 5mm to 15cm thick	Angular to sub-angular coarse sand. Poorly sorted	10YR6/4	Light Yellowish Brown	All
II	Dark humic cultural sediment interspersed with charcoal and shell. Moderately well sorted	Sub angular fine sand 1/8mm – 1/4mm with silt <1/16mm with a trend towards granular	10YR3/1	Very Dark Grey	All
III	A grey unit of sand interspersed with charcoal and shell fragments.	Fine to medium grained 1/4mm to ½ mm sub angular and granular	10YR5/1	Grey	All
IV	Moderately well sorted ash lens rich with charcoal fragments and shell. Ill-defined boundaries in places	Silt <1/16mm rounded to sub rounded very fine grained	10YR6/2	Light Brownish Grey	All
V	Midden Lens with shell material highly burnt and friable and ashy lenses interspersed throughout	Fine grained sand and silty sediment. Well sorted sediment. Some fragments ferruginous sandstone throughout.	10YR4/2	Dark Greyish Brown	T1
VI	Coarse grained sand sediment interspersed with some charcoal and shell. Light yellowish brown to grey and sits over consolidated beach rock	Angular sand and silt, shell grit and granular	10YR6/4	Light Yellowish Brown	3
VII	Consolidated beach sediments made up of shell grit and sand. Very compact and hard	Very granular and shell grit	10YR8/4/ - 10YR8/6	Yellow Brown to Yellow sediment	All
VIII	Rich charcoal lens features, some fragments of shell	Very fine silt	10YR2/1	Black	All
IX	Mostly of sand with some laterite granules; high density roots from grass	Very coarse grained; consists of granules; Angular to sub-angular sediment	10YR4/6 – 10YR 6/4	Dark Yellow Brown to Yellow Brown	T7; Test Pits
X	Medium to coarse sand with shell granules	Sub angular to sub rounded	10YR 6/6	Brownish Yellow	T7; Test Pits

UNIT	Description	Sediment	Munsell	Colour	Trench
XI	Pebble layer sitting on top of formed SST from former beach surface. SST fragments, cobbles, and pebbles Shell grit and coarse grained sand and well-rounded small pebbles typical of high energy wave action under dense pebble layer	SST fragments, cobbles, and pebbles Shell grit and coarse grained sand and well-rounded small pebbles	-	-	Test Pits
XII	Ferruginous sandstone parent rock at base of sand. SST overlain by a very thin layer of fine grain sand with organic staining.	Ferruginous sandstone parent rock	-	-	Test Pits

### Trench 3

This trench is located on a low flat area between Stoneline 2 and Stoneline 3 in an area that was largely left unexcavated by Macknight (1969). To the north of this area, Macknight (1969) excavated an area titled S.H.F to reveal a trepang processing working floor. Given this is a similar low and flat area to the S.H.F excavation, the aim here was to reveal a similar floor feature to obtain samples for radiocarbon carbon dating. Stratigraphic Units I, II, III, IV, V, and VII are present in this trench (Figure 8). The sediment was largely compacted with sandy soil interspersed with shell, inclusions of charcoal and well defined ashy lenses with earthenware fragments. The sediment in this trench tended to be dark humic grey sand in the top 10cm and then revealed Unit IV concentrations of charcoal, shell, and ash lenses. Lenses of densely packed shell were found in SUV. The second highest number of earthenware sherds ( $n=39$ , 91.8g) were recovered throughout this trench down to the base of SUIII (XU7) at a depth of 20cm. This trench revealed a number of charcoal and ash rich lenses that are likely to represent the trepang ash pits as identified previously by Macknight (1969). The west stratigraphic profile of the trench illustrates the dipping down of the lenses into the underlying units. At the base of the unit was SUVI sediments. A charcoal sample was taken from this trench in XU3 from within one of the intact dark charcoal-ash rich lenses (SUIV) that are possibly indicative of the Macassan trepang burying pits previously identified by Macknight (1969).



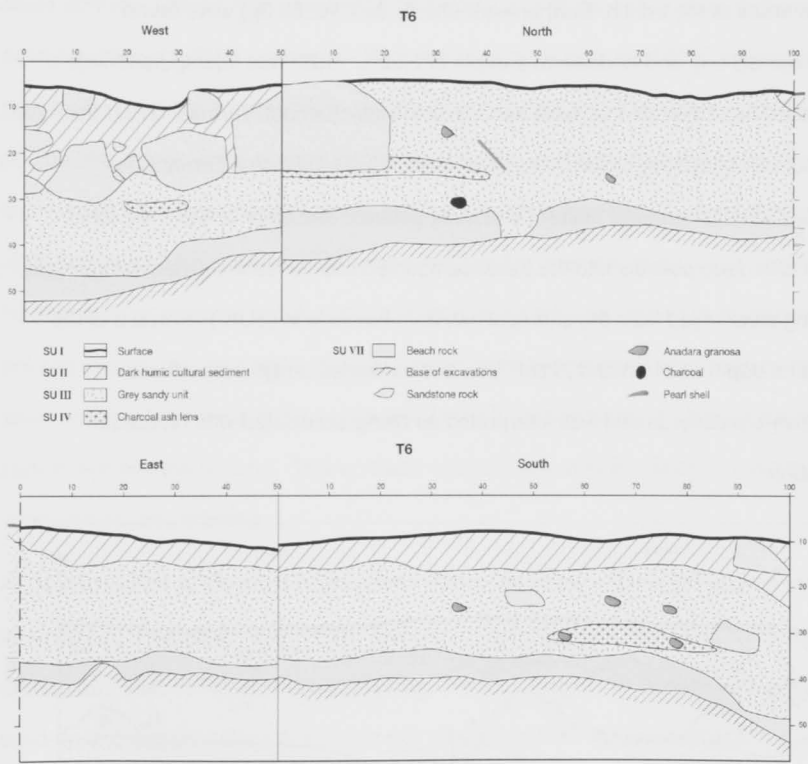
**Figure 8.** Section drawing for Trench 3 (CartoGIS ANU)

## Trench 6

Stoneline 3 was chosen for sampling given its structural integrity and high magnetometer results that guided us to look for *in-situ* charcoal samples associated with the trepang boiling activity. Trench 6, Square 1/4, was excavated in the centre of the stoneline revealing the central spine of stone construction to the western end of the trench. The trench contained Stratigraphic Units I, II, III, IV, V, and VII (Figure 9). The excavation reached the end of the cultural deposit associated with the stoneline in XU7 on the compacted chenier surface. Interestingly the excavation exposed a darker brown-grey soil (SUIII) under the actual central spine of the stoneline. To the north of the square, Unit II is missing, presumed eroded; however it is present in the stoneline. Multiple charcoal and ash rich lenses were found throughout the cultural sediments in the trench, with dark charcoal lens extending out from the stoneline. Fragments of *Palcuna lincolnii* (pearl shell) tended to be rich in these ash lenses. *Anadara granosa* was found throughout the excavation. Few earthenware potsherds were recovered

from this trench, with one earthenware sherd found in centre of the square lying at the interface with beach sand and cultural sediments in XU7.

A total of six dating samples were taken from Trench 6. It was important to establish a range of dates within the one stoneline to establish a chronology of use. Samples were taken from the base of stoneline rock within the dark charcoal and ash lens around the stones which was interpreted to be from using the stoneline to process trepang. Another sample was taken from the interface of SUIII and SUVII. A charcoal also sample was taken from the interface of the stoneline rock and SUIII in the north-west corner of the square.



**Figure 9.** Section drawing for Trench 6 (CartoGIS ANU)

Trench 8

This trench is located to the north of Trench 3 and was excavated to further expose areas of the Macassan working areas. It is located in the centre of a triangle formed by Stoneline 2, Stoneline 3, and Stoneline 20. Trench 8 consists largely of Stratigraphic Units, I, II, III, and V (Figure 10). It is similar to Trench 3 with a large amount of shell, charcoal, and earthenware pieces commingled throughout. The dark humic sandy SU I gave way to the grey sandy Unit III which was on top of the shell rich Unit V. Shell consisted largely of *Anadara granosa*, *Palcuna lincolni*, *Terebralia striata*) and *Telescopium telescopium* with *Nerita* spp. and also were found in small dense pockets in some areas of the trench. Earthenware sherds (n = 16, 60.3g) were found throughout SU I, II, and IV down to a depth of 22cm. SU III was interspersed with dense shell hearth areas that were ash rich with little charcoal. This trench did not have the exact same layering of ashy lenses as Trench 3. The zones differentiating stratigraphic units were not uniform and quite uneven. The base of SU III was quite uneven with deep pockets into the basal compacted chenier sands. Charcoal samples for dating were taken from the charcoal rich dark humic lens (SU IV) in Area 2 of the trench at a depth of 21cm and 22cm. This unit contained a high proportion of earthenware potsherds and was interpreted as being associated with Macassan occupation.

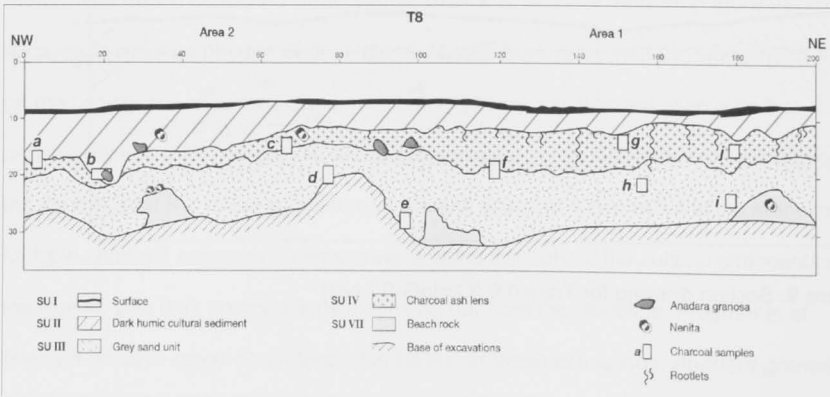


Figure 10. Section drawing for Trench 8 (CartoGIS ANU)

## Test Pit 2

Test Pit 2 was excavated at the base of the dune and the small sand dune behind the current line of mangroves. Macknight (1969, 1976) hypothesized that these mangroves have recently colonized the beach area since abandonment of the site as a trepang processing centre. This area was not excavated by Macknight (1969) as the area was not considered to be part of the working or trepang processing areas. A shovel test pit was excavated at the interface of the recent sand and the dark humic sediments of the site to examine possible geomorphological and site formation processes that have impacted on the Malara peninsula. The trench was orientation north-south and was 45cm (EW) by 175cm (NS). The trench revealed 20cm of the recent sand dune system overlying the older SUIII sediments. Stratigraphic Unit III consisted of 33cm stratum of grey humic charcoal rich sand with significant concentrations of charcoal in the lower portion of the unit. Some economic shell species (i.e. *Anadara granosa*) were found in low densities in a grey medium to fine grained sand that formed at its base. At the base of SUIII was Unit XI, a water rolled cobble and pebble layer sitting on top of sandstone fragments from a former beach surface. This layer found over Unit XI consisting of shell grit and coarse grained sand and well-rounded small pebbles typical of high energy wave action. At the base of the trench was Unit XII consisting of ferruginous sandstone parent rock at base of sand. This unit was overlain by a very thin layer of fine grain sand with organic staining.

As Macknight (1969:98-99) has previously stated, trepang processing required vast quantities of firewood for the various stages of processing which has contributed to the widespread dark sandy deposits at Macassan sites. SUIII in this trench represents the build-up and accumulation of charcoal rich sediments from Macassan trepang firing activity at the base of the primary Malara dune. Therefore three large charcoal pieces were taken from western profile of the SUIII charcoal rich grey sandy unit at depths of 41cm, 40cm, and 37cm to date the accumulation of this stratum.

## Stoneline 17

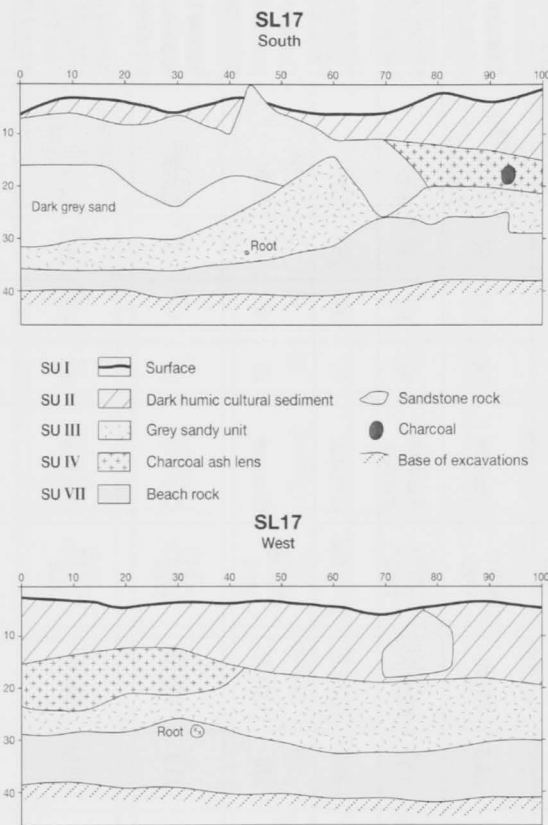
Stoneline 17 is located in an area of the Malara site complex that Macknight (1969) hypothesized to be likely the earliest area of trepang processing occupation. Excavation of this stoneline encountered layering of Stratigraphic Units II, III, IV, and VII (Figure 11). Unit II produced fairly homogenous sediment with some rootlets interspersed throughout and patchy areas of dark grey and charcoal specks and flecks in sediments. The lower sediments of SUIII were coarser grained sand than SUIII on the ridge, however they contained very low or no shell grit content. There was a change at the base of the dark grey sediment to a fine grained loose to moderately compacted sand unit. This basal unit is distinctly different to compacted chenier sand unit found at the base of all the cultural deposit on top of the Malara ridge. The sand sediments appeared to be typical of re-deposited sand dune. Few economic shell species were recovered in this excavation with most shell appearing to be mostly non-economic species shell. Only one fragment of earthenware was recovered from the surface of the excavation. A charcoal sample was taken from underneath a stoneline rock which was removed in the excavation at a depth of 34.5cm. A second sample was taken at a depth of 57cm at the interface between SUIII and SUVII basal sand layer.

## CHRONOLOGY

The series of radiocarbon dates presented here are from archaeological features on the site previously identified by Macknight (1969, 1976) which included trepang processing stone lines, trepang processing working floors, teeth enamel from the two Macassan burials recovered by Macknight (1969, 1976) as well as one geomorphological test pit to examine Malara site formation processes. Table 4 provides the radiocarbon dates and associated data from Malara. OxCal calibration and Bayesian analysis illustrates the distribution of the dates from the stonelines, burials (Theden-Ringl et al. 2011), working floors, and the geomorphological test pit are shown in Figure 12. Although the calibrated date ranges are wide, there are three distinct groupings of dates that can be identified as *Early*, *Middle*, and *Late*. The dates



show a trend of human activity on the site potentially from the 17<sup>th</sup> Century through to the 20<sup>th</sup> Century.



**Figure 11.** Section drawing for Trench Stoneline 17SQ1 (CartoGIS ANU)

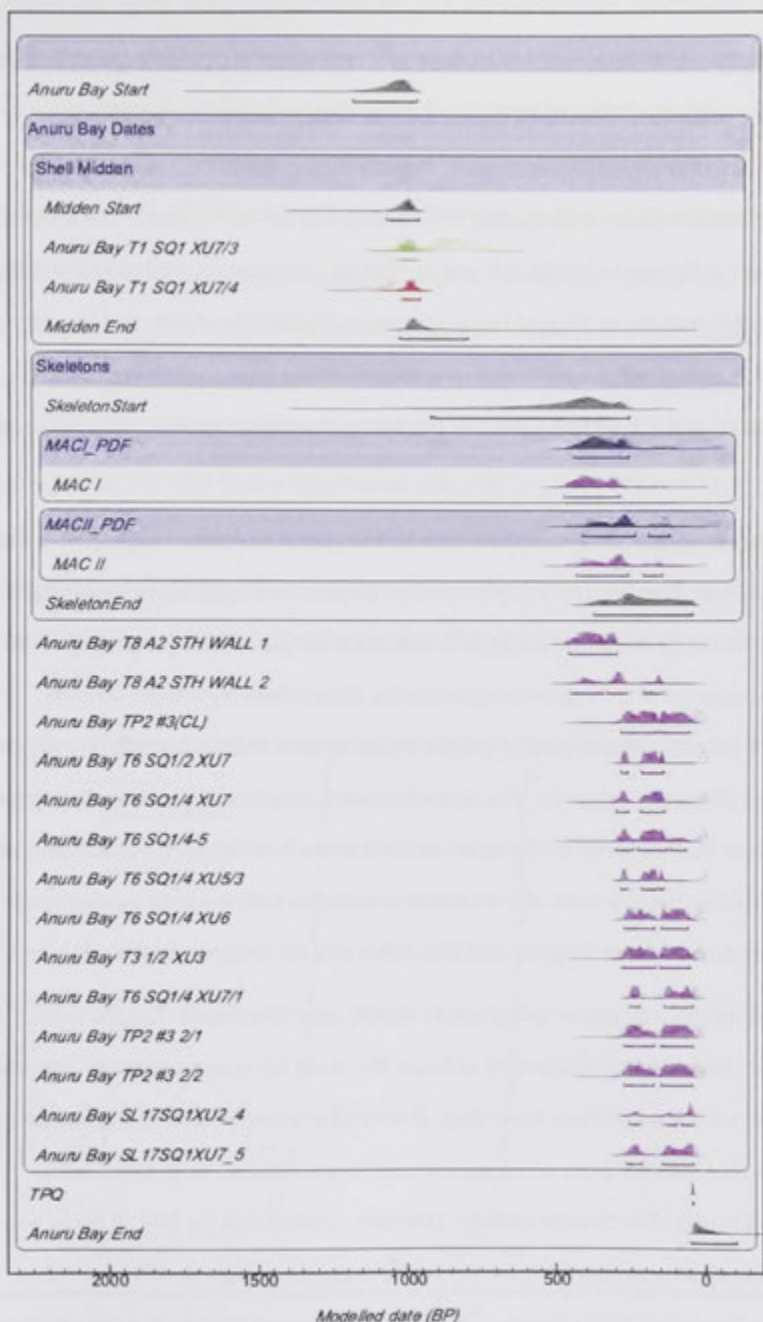
Table 4. Malara (Anuru Bay A)  $^{14}\text{C}$  sample data and collection context (Calibration using Oxcal v4.2.3 Bronk Ramsay (2013); 95.4% probability)

Sample	Sample#	Feature	d13C	14CAge	Cal AD*	Material	X (cm)	Y (cm)	Z (cm)	Unit	Comments
Anuru Bay SL17SQ1XU2-4	Beta-301235	Stoneline	-26.5	30 $\pm$ 30	1890 to 1910	Charcoal	16	25	34.5	SUII	Charcoal sample from under rock.
Anuru Bay SL17SQ1XU7-5	Beta-301236	Stoneline	-28.3	70 $\pm$ 40	1810 to 1930	Charcoal	100	100	37	SUIII and SUVII Interface	Charcoal sample at interface of basal sand layer
Anuru Bay T1 SQ1 XU7/3	GNS-32372	Midden Lens	-1.10	1373 $\pm$ 20	1020 to 1153	<i>Anadara granosa</i>	92	96	31	SUV	Midden lens, charcoal rich highly burnt shell
Anuru Bay T1 SQ1 XU7/4	GNS-32471	Midden Lens	-24.3	1209 $\pm$ 20	727 to 885	Charcoal	49	96	26.5	SUV	Midden lens, charcoal rich, highly burnt shell
Anuru Bay T3 1/2 XU3	GNS-32472	Working Floor-Trepang Pit	-30	130 $\pm$ 40	1798 to 1896	Charcoal	20	46	12	SUIV	Charcoal sample from burnt rock northwest of square with ashy lens.
Anuru Bay T6 SQ1/2 XU7	ANU#21419	Stoneline	23.9	179 $\pm$ 20	1735 to 1784	Charcoal	30	11	25	SUVIII	Sample taken from charcoal attached to the stone within the stoneline.
Anuru Bay T6 SQ1/4 XU5/3	GNS-32451	Stoneline	-25.6	179 $\pm$ 15	1732 to 1809	Charcoal	22	4.5	25.5	SUVIII	Sample taken from base of stoneline rock at SW end. Dark charcoal and ash lens around stones.
Anuru Bay T6 SQ1/4 XU6	GNS-32520	Stoneline	-24.8	131 $\pm$ 25	1800 to 1893	Charcoal	5	7.5	39	SUIII and SUVII Interface	Unit interspersed with cultural deposit and sand level. Sample taken from interface of SUIII and SUVII

Sample	Sample#	Feature	d13C	14C Age	Cal AD*	Material	X (cm)	Y (cm)	Z (cm)	Unit	Comments
Anuru Bay T6 SQ1/4 XU7	ANU#21421	Stoneline	-34	195 $\pm$ 30	1729 to 1810	Charcoal	-	-	35	SUIII	Dark charcoal and ash lens around stones. Sample from under stoneline claystone rock west wall
Anuru Bay T6 SQ1/4 XU7/1	GNS-32452	Stoneline	-24.9	97 $\pm$ 15	1812 to 1919	Charcoal	7	40	35	SUIII and SUVII Interface	Sample of charcoal from interface in NW corner.
Anuru Bay T6 SQ1/4-5	ANU#21420	Stoneline	-30	185 $\pm$ 40	1720 to 1819	Charcoal	5	10	26.5	SUVIII	Sample taken from base of stoneline rock at SW end. Dark charcoal and ash lens around stones.
Anuru Bay T8 A2 STH WALL 1	ANU#21418	Living/Working Floor	-34	315 $\pm$ 30	1484 to 1648	Charcoal	69	13	21	SUIV	Charcoal sample taken from south wall of trench. Lens of rich dark humic lens of charcoal and ash
Anuru Bay T8 A2 STH WALL 2	ANU#21424	Living/Working Floor	-33	255 $\pm$ 40	1616 to 1682	Charcoal	70	6	22.5	SUIV	Charcoal sample taken from south wall of trench. Lens of rich dark humic lens of charcoal and ash
Anuru Bay TP2 #3 2/1	ANU#21423	Base of dune	-33.8	115 $\pm$ 40	1799 to 1941	Charcoal	-	-	41	SUII: Dark humic charcoal rich sediment	Sample of charcoal from the western profile of the humic sand charcoal and some shell interspersed.

Sample	Sample#	Feature	d13C	14CAge	Cal AD*	Material	X (cm)	Y (cm)	Z (cm)	Unit	Comments
Anuru Bay TP2 #3 2/2	ANU#21425	Base of dune	-33.98	120±40	1799 to 1942	Charcoal	-	-	40	SUII: Dark humic charcoal rich sediment	Sample of charcoal from the western profile of the humic sand charcoal and some shell interspersed.
Anuru Bay TP2 #3(CL)	ANU#21435	Base of Dune	-32.28	145±45	1666 to 1785	Charcoal	-	-	37	SUII: Dark humic charcoal rich sediment	Sample of charcoal from the western profile of the humic sand charcoal and some shell interspersed.

\* Calibration using Oxcal v4.2.3; >40% probability; IntCal09; Marine reservoir calibration 408 years (Briker et al 2007); 95% Probability, > 60% Mean Confidence



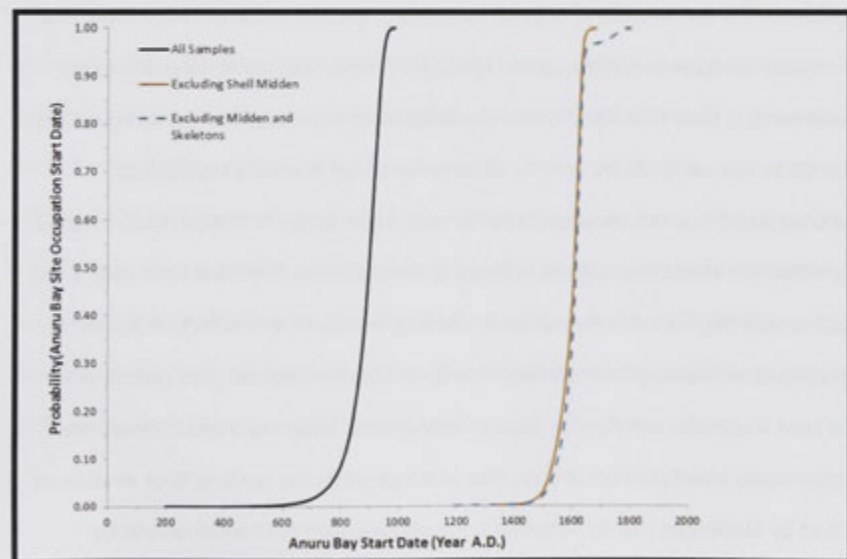
**Figure 12.** Modelled radiocarbon dates (calBP) from recent excavations at the Anuru Bay trepang processing site (OxCal IntCal09).

The early group of dates, which includes the MACII burial, suggests a mid to late 17<sup>th</sup> Century occupation. The Middle group of dates strongly correlates with the intensification of the Macassan trepang industry during the 18<sup>th</sup> Century. The Late group of dates extends from the late 19<sup>th</sup> Century into the 20<sup>th</sup> Century. The advantage of dating the Macassan burials is that there can be no argument regarding the context of the dated material or if it is of Macassan origin (Theden-Ringl et al. 2011). As previously discussed, the calibrated date ranges do not have smooth probability distributions and it is difficult to assess the timing of initial occupation using only Figure 12.

To further investigate the most likely date for the start of Macassan trepang processing visits to Anuru Bay, we performed a series of Bayesian analyses and used analytical tools provided by the OxCal program to determine the probabilities associated with initial occupation in fewer than three scenarios (Bronk Ramsey 2009). The first scenario (termed "All Samples") includes the full suite of radiocarbon determinations obtained during our research. The second scenario includes all determinations except those from the Aboriginal shell midden as the midden is unlikely to be associated with the Macassan trepang visits. A third scenario excludes both the shell midden and the skeleton-derived determinations and thus relies only on charcoal determinations.

The first step in a Bayesian analysis is to identify prior information relevant to the situation. Because the stratigraphy at Anuru Bay does not support detailed stratigraphic assessment across multiple stone lines, stratigraphic superposition is only relevant for the two shell midden dates which were located in two different spits of the same excavation unit. The skeletal remains, however, showed that the MAC II burial was disturbed and therefore post-dates the MAC I burial (Macknight and Thorne 1968; Theden-Ringl et al. 2011). Finally, it is clear from historical records that the site was certainly occupied prior to AD 1907, which provides a *terminus ante quem* date for our analysis. This midden stratigraphy, burial sequence, and *terminus ante quem*

information are incorporated into our analysis, with the radiocarbon determinations otherwise treated as a single phase. The full code for the OxCal analysis is provided in Supplemental Appendix J. Because enamel does not remodel after formation, its carbon dates tooth formation processes rather than individual death so we have incorporated age offsets based on Macknight and Thorne's (1968) age estimation of each skeleton. OxCal uses the radiocarbon determinations and prior information to produce a *posterior density function* (PDF) which represents the probability that the site was first occupied during a certain time span (see the "Anuru Bay Start" boundary in Supplemental Appendix B). A more intuitive view of the result is available by integrating under the PDF from a hypothetical start time (e.g., AD 1) to a date of interest. This produces the probability, as best estimated by radiocarbon determinations and other known information, that a site was first occupied by that date. We performed this procedure for a wide range of dates for each of the above scenarios (Figure 13; Appendix B).



**Figure 13.** Bayesian analysis distribution of the probable dating three scenarios

The analysis clearly shows that the shell midden predates the stone lines and burials, and that the skeleton-derived samples by themselves do not strongly drive the initial occupation date. This is not a surprise; it is suggested by Figure 13 as well. Of more interest is the quantification of initial occupation date estimates. Excluding the Indigenous shell midden, the curves indicate that there is slightly more than a fifty percent chance that Macassan visits to Anuru Bay began by AD 1622. There is an eighty percent chance that they began by AD 1637. Thus, Macassan visits to Anuru Bay most likely began in the third decade of the seventeenth century. (The common, reflexive use of 2-sigma or 95 percent probabilities is derived from frequentist statistics and is not appropriate for this analysis; we believe that a greater than fifty percent chance is an appropriate definition of "most likely", but recognize that other researchers may prefer 80 percent.) There is less than 0.1 percent chance that Macassans waited until after 1780 to first visit Anuru Bay for trepang collection.

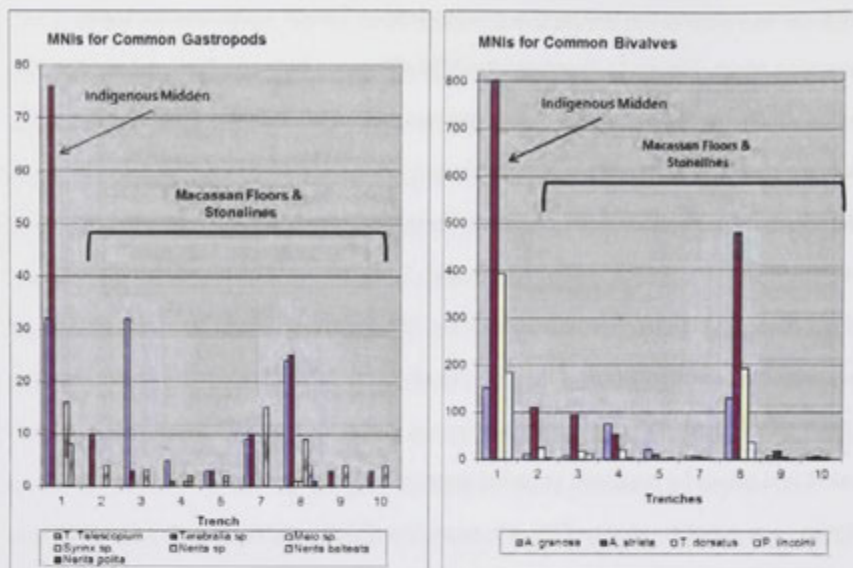
## DISCUSSION

Re-excavation of the Anuru Bay trepang processing site found subsurface Indigenous shell midden deposits nearby the area Macknight (1969, 1976) took his radiocarbon charcoal sample from Stoneline 7. This shell midden deposit returned a calibrated date of 772 AD to 886 calAD (NZA 32471). Excavation of the Macassan living and processing areas has also revealed an extensive assemblage of shell midden material *in-situ* within the Macassan cultural features and work areas. It is clear from examining the taphonomic factors occurring at the Anuru Bay site that there is likely to be some intermixing of archaeological materials relating to earlier Indigenous occupation with that of later Macassan activity. Although in stating this, Trenches 3 and 8 clearly have stratigraphically intact pockets of shell lens features within the working floor stratum as identified by Macknight (1969). Whether the shell has been consumed on-site by Macassans, or other Indonesian seafarers, or in the intervening periods between trepang processing by Indigenous people is difficult to discern. An indicator of the ethnicity of consumption might be reflected in the diversity and abundance of economic



shell species between the Indigenous midden lens in Trench 1 and the Macassan processing areas. Figure 14 illustrates the MNI difference between Trench 1 shell species which are assumed to be from Indigenous consumption and Trenches 2 to 10 which are clearly in zones of Macassan trepang processing features. The lower MNI values for both gastropods and bivalves in Trenches 2 to 10 could possibly reflect these shellfish were consumed by Macassans. Trench 8 contains higher gastropod species diversity than the Indigenous midden. The Macassan areas also include the three lesser economically productive species of *Nerita* spp. which can be easily found on the intertidal ferruginous sandstone outcrops of the peninsula. These species were present and therefore assumed to be not economically viable during the earlier Indigenous occupation phase of the site even though the sandstone outcrops into the bay also existed at this time. Therefore the conclusion is that shell species present in the Macassan features excavated on the site could possibly reflect Macassan consumption of local shellfish rather than just an intermixing of older shell.

Macknight's (1969:224) charcoal sample from Stoneline 7 was located near the top of the sand ridge and collected at a depth of 30cm. This sample is located in close proximity and depth to the shell midden feature as uncovered in Trench 1. It is very likely that the charcoal sourced from the sediments rich in charcoal at the northern end of Stoneline 7 were part of the Indigenous shell midden matrix found at this location of the site near the crest of the chenier. Our excavation has revealed the construction sequence of the stonelines involved the initial excavation of the soil to set the foundation or 'backbone' of the stoneline (See Trench 6). Digging into the existing surface at Malara would certainly have disturbed older deposits.



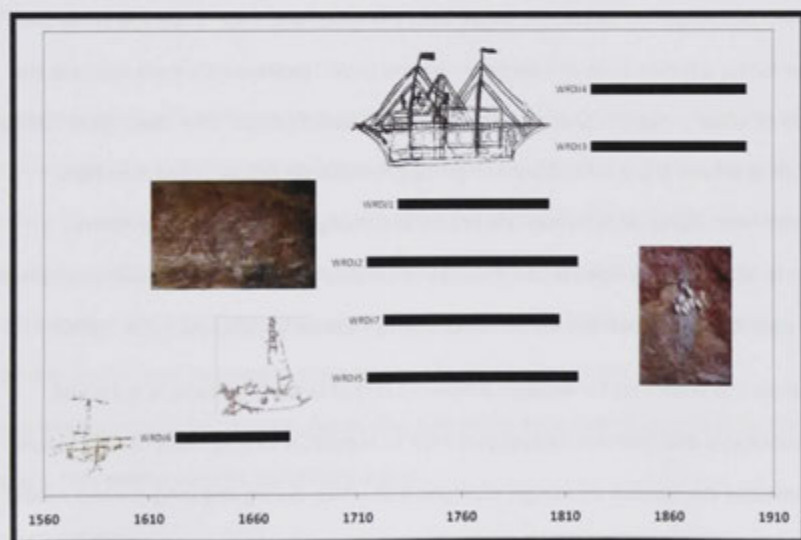
**Figure 14.** MNI distribution of economic bivalve and gastropod species from Indigenous and Macassan use areas at Malara, (Anuru Bay A)

Similarly, the section drawings illustrating the approximate location of the ANU-241 charcoal lens sample from Lyäba Stoneline 13 places it below the Macassan working and living floor uncovered by Macknight (1969:Sheet6). At Entrance Island, Macknight (1969:Figure5.9) shows his sample ANU-242 is taken from a dark charcoal rich lens that appears to be separated by 15cm to 20cm of sandy sediment from the above stratum clearly associated with the use of the site as for trepang processing. Again, like Malara, the best explanation for the early dates at these two sites is that Macknight uncovered an existing Indigenous shell-charcoal hearth feature at Lyäba and Entrance Island. Thus the three early dates from Lyäba and Entrance Island and Anuru Bay (Table 2) can be most parsimoniously explained as being unrelated to the Macassan occupation, without the need to invoke the 'old wood' problem (Macknight 1976).

### Implications for Local Archaeology

Radiocarbon determinations that are comparable to our results from the Malara trepang site have been reported from the Djulirri rockshelter (Taçon et al. 2010). Figure

15 illustrates a series of calibrated radiocarbon dates from beeswax pellets taken from the Djulirri rockshelter in the nearby Wellington Range that provide a minimum age for contact rock art. Results from radiocarbon dating of beeswax (WRDJ6) over rock art paintings of an Indonesian traditional sailing vessel indicates that it is likely to be older than 1630 AD $\pm$ 35 years (95.4% Probability with 51% Mean Confidence) (Taçon et al. 2010). This date is consistent with the results from Malara. Together, Malara and the Djulirri rockshelter dates have significant implications for the timings of initial local culture contact in western Arnhem Land. We hypothesize that in the Anuru Bay and Wellington Range region there has been a period of culture contact probably beginning sometime early in the 17<sup>th</sup> Century, circa 1650AD, with the possibility of Indonesian mariners exploring and exploiting other resources from along the Arnhem Land coastline prior to the establishment of the trepang industry. The dates and archaeology indicate an intensification of site use at Malara during the historically recorded period of trepang harvesting. Therefore our results support the longer culture contact model.

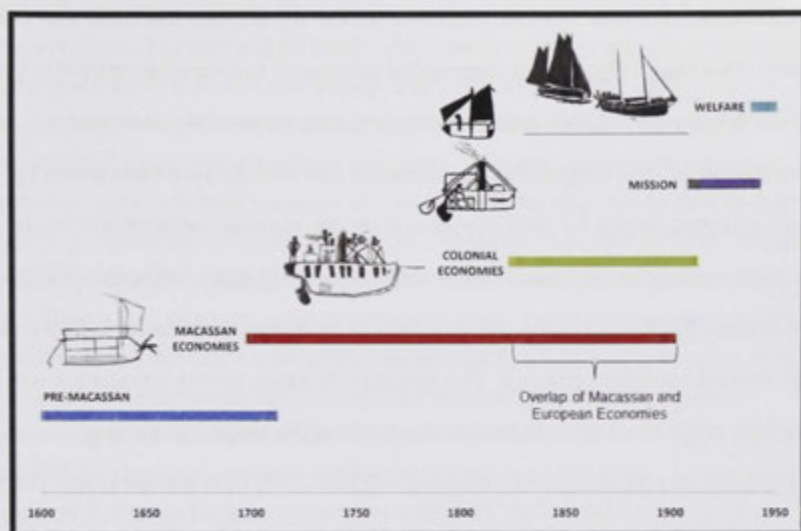


**Figure 15.** Calibrated radiocarbon dates (calAD) on beeswax samples from the Djulirri Rockshelter (Taçon et al. 2010)

Archaeological surveys of the nearby coastline, coastal plains, and Wellington Range have found Indigenous archaeological sites consisting of rock art, rockshelters, artefact scatters, scarred trees, stone quarries, shell middens, and shell scatters. Of the 183 Indigenous rock art sites recorded, 18 sites contained contact rock art. Out of this sample, only nine sites contained contact rock art, occupation deposits with large galleries of rock art paintings (defined as containing greater than 100 motifs). Contact period artefacts consisted of a wide diversity of materials including glass bottles, glass fragments, flaked glass, modified iron spears and points, an iron adze, several iron hatchets, metal knives, bone handled spoon, enamel bowl, iron and tin fragments, ceramic and earthenware sherds, and glass beads (Wesley and Litster *in press*). Wooden artefacts modified by a metal tool were noted in six sites. The Djulirri rock art complex contains the largest concentrations of rock art with over 1300 motifs in the main shelter (Taçon et al. 2010). Research of Indigenous site distribution in the Wellington Range has shown that this area becomes a significant focal point for Indigenous occupation as people travel from the south and east. Thus the Wellington Range forms a buffer zone of interaction where local Traditional Owners mediate the access of other groups to Macassans and their material goods. The Wellington Range also forms a focal point for Indigenous groups to mediate exchange of materials collected from Europeans further afield on the Coburg Peninsula. This evidence supports Mitchell's hypothesis of a change in the exchange patterns in western Arnhem Land after European settlement on the Cobourg Peninsula (Mitchell 1994, 1995). Therefore it is proposed for western Arnhem Land at least, that there is sufficient archaeological and anthropological evidence to support a long contact model. Figure 16 illustrates the various economic changes that occur during this long contact model with significant overlap of Macassan and European activity in western Arnhem Land. The increased Macassan trepang industry activity from the 1780s AD would have been a significant driver for the proliferation of Indigenous interaction with Macassans and

change within their own social customs and traditions as have been well documented.

Prior to 1780AD,



**Figure 16.** Long contact model of Indigenous engagement with Macassan and European economies in north western Arnhem Land (Rock art motifs from Malarrak and Djulirri, Wellington Range).

Indigenous groups in north western Arnhem Land may have developed methods of communication and expectations from early encounters that facilitated the booming trepang economy. The earlier contact would have facilitated later participation and engagement with Macassan sailors more readily leading to a fluid transition to accepting the significant increases occurring in the trepang industry and thereby reducing conflict and increasing trade and exchange opportunities. These circumstances then contribute to Anuru Bay becoming established as one of the largest trepang processing centres in Arnhem Land.

## CONCLUSION

This research has outlined the archaeological investigations undertaken to determine a chronology of occupation and site use by Indonesian mariners at the Malara (Anuru Bay A) that may have occurred over a period of 250 years. The chronological data

presented from this site, in combination with other research in the nearby Wellington Range has shown there is a case to support a long culture contact model. In the Bayesian radiocarbon date analysis presented earlier, we estimate that there that there is slightly more than a fifty percent chance that Indonesian mariners had started to visit the Anuru Bay site by 1622AD, before the trepang industry was fully underway in eastern Indonesia. This early occupation evidence was likely to have been driven by different economic factors for the Indonesian mariners, but required landfall at Anuru Bay. We have also demonstrated that the early radiocarbon dates Macknight (1969, 1976) obtained from Anuru Bay A are very likely to have been from earlier Indigenous midden deposit containing charcoal. Our radiocarbon dating indicates that there was a proliferation in site occupation and use at the height of the Macassan trepang processing industry as proposed by Macknight (2008, 2013) from the mid to late 1700s AD. The radiocarbon dating also supports the assumption that the site was in use for trepang processing into the early-mid 19<sup>th</sup> Century. Current constraints of radiocarbon dating calibration at this time will not provide an exact date for when the site was first occupied or abandoned by Macassans trepangers. Radiocarbon dates from Stoneline 17 suggest that the site was still in use in the late 19<sup>th</sup> or early 20<sup>th</sup> Century which could be from re-use of the stoneline by European trepangers or as an Indigenous hearth. The lack of historic observations of Macassans using Anuru Bay after 1880 when more regular European observations and reports were taking place is likely to be a testament that the site had dropped out of use by this time. Therefore it is very likely that Anuru Bay played an important ongoing role over 250 years as a locus for culture contact between the local Indigenous Maung Traditional Owners and the early visiting Indonesian mariners and then later Macassan trepangers.

#### (iv) acknowledgments

##### Acknowledgements

Fieldwork was undertaken by Daryl Wesley and Sue O'Connor for the Australian Research Council funded project Baijini, Macassans, Balanda, and Bininj: Defining the Indigenous Past of Arnhem Land through Culture Contact (LP0882985) with contributions from the Linkage Partners Bushfires Council NT and the Department of Sustainability, Environment Heritage and Water. The authors would like to thank Traditional Owners Ronald Lamilami and his family of the Managowal clan for their support, guidance and enthusiasm throughout fieldwork from 2008 to 2010. Dr Jack Fenner provided the mapping. Flinders University collaborators Dr Jennifer McKinnon, Jason Raupp, and students assisted with excavations and magnetometer field survey of the Malara (Anuru Bay A site) and advice on maritime fishing and whaling. Jay Chin and Janelle Stephenson for contributing their palaeoecological work from the assessment of the nearby Amanabarri Lagoon. The Authors would like to thank CartoGIS for production of maps and figures used in this publication. Tony Barham organised Australian National University (ANU) (ARCH8002) field participants. Grateful thanks for assistance ANU volunteers and Masters of Archaeological Science (ARCH8002) students, as well as volunteers from the University of Queensland, Heritage Conservation Branch, Department of Natural Resources, Environment, Arts, and Sport and abroad. Thanks are also due to Katherine Seikel, Mirani Litster, and Melissa Hetherington for laboratory supervision and ANU undergraduate student volunteers for sorting the excavated materials. The North Australia Research Unit (ANU) in Darwin supported the project with a base of operations for the fieldwork in the Northern Territory. The authors would like to thank Sally Brockwell (ANU) for providing comments on drafts of the paper.

## (v) references

## REFERENCES

- Allen, M.S. and A.E. Morrison. 2013. Modelling site formation dynamics: Geoarchaeological, chronometric and statistical approaches to a stratified rockshelter sequence, Polynesia. *Journal of Archaeological Science* 40(12):4560-4575.
- Alongi, D.M. 2002. Present state and future of the world's mangrove forests. *Environmental Conservation* 29(3):331-349.
- Alpers-Afil, N. 2008. Continual fire-making by Hominins at Gesher Benot Ya'aqov, Israel. *Quaternary Science Reviews* 27(17-18):1733-1739
- Baker, R. 1984. Macassan Site Survey and Bibliography. Unpublished report to the Museum and Art Galleries of the Northern Territory.
- Bednarik, R.G. 2012. The Use of Weathering Indices in Rock Art Science and Archaeology. *Rock Art Research* 29(1):59-84.
- Berndt, C. H. 1961. The quest for identity: the case of the Australian Aborigines. *Oceania* 32(1):16-33.
- Berndt, R.M. and C.H. Berndt. 1949. Secular figures of northeastern Arnhem Land. *American Anthropologist* 51(2):213-222.
- Berndt, R.M. and C.H. Berndt. 1952. *The First Australians*. Sydney: Ure Smith.
- Berndt, R. M. and C. H. Berndt. 1954. *Arnhem Land: its History and its People*. Melbourne: FW Cheshire.
- Bird, M.I. 2007. Radiocarbon Dating: Charcoal. In *Encyclopedia of Quaternary Science*. S. A. Elias (ed). pp. 2950-2958. Oxford, Elsevier.
- Blair, S. and N. Hall. 2013. Travelling the 'Malay Road': Recognising the heritage significance of the Macassan maritime trade route. In *Macassan History and Heritage: Journeys, Encounters and Influences*. M. Clark and S.K. May (eds). pp. 205-226. Canberra: ANU E-Press.
- Blasco, F., P. Saenger, and E. Janodet. 1996. Mangroves as indicators of coastal change. *Catena* 27(3):167-178.
- Bourke, P. 2000. Late Holocene Indigenous economies of the tropical Australian coast: an archaeological study of the Darwin Region, Unpublished PhD thesis, Department of Anthropology, Northern Territory University.
- Bourke, P., and Q. Hua. 2009. Examining late Holocene marine reservoir effect in archaeological fauna at Hope Inlet, Beagle Gulf, north Australia. In *New Directions in Archaeological Science*. A. Fairbairn, S. O'Connor and B. Marwick (eds). pp. 175-187. Canberra, ANU E-Press.
- Brijker, J.M., S.J.A. Jung, G.M. Ganssen, T. Bickert, and D. Kroon 2007 ENSO related decadal scale climate variability from the Indo-Pacific Warm Pool. *Earth and Planetary Science Letters* 253(1):67-82.



- Brockwell, C.J. 1989. Archaeological Investigations of the Kakadu Wetlands, Northern Australia, Unpublished M.A. Australian National University.
- Brockwell, S. 1996a. Mound sites on the Adelaide River coastal plains. *Bulletin of the Indo-Pacific Prehistory Association* 15:159-164.
- Brockwell, S. 1996b. Prehistoric settlement patterns on the Adelaide River, northern Australia. *Australian Aboriginal Studies* 1:45-59.
- Brockwell, S. 2009. *Archaeological settlement patterns and mobility strategies on the lower Adelaide River, Northern Australia*. Oxford, British Archaeological Reports.
- Bronk Ramsey, C. 2009. Bayesian analysis of radiocarbon dates. *Radiocarbon* 51(1):337-360.
- Bulbeck, D. 1989. A first report on some combined historical and archaeological work in south Sulawesi. *Indo Pacific Prehistory Association Bulletin* 9:118-121.
- Bulbeck, D. and G. Clune. 2003. Macassar historical decorated earthenwares: Preliminary chronology and Bajau connections. In *Earthenware in Southeast Asia*. J. Miksic (ed). pp. 890-102. Singapore: Singapore University Press.
- Bulbeck, F.D. and B. Rowley. 2001. Macassans and their pots in northern Australia. In *Altered States: Material Culture Transformations in the Arafura Region*. C. Fredericksen and I. Walters (eds). pp. 55-74. Darwin: Charles Darwin University Press.
- Chin, H. 2010. A palaeoenvironmental study of Amanabarri Lagoon, Northern Territory, Australia. An unpublished Masters of Archaeological Science report, Department of Archaeology and Natural History, Australian National University.
- Clark, M. 2013. Tangible heritage of the Macassan-Aboriginal encounter in contemporary South Sulawesi. In *Macassan History and Heritage: Journeys, Encounters and Influences*. M. Clark and S. May (eds). pp. 1-18. Canberra: ANU E Press.
- Clark M. and S.K. May 2013 Understanding the Macassans: A regional approach. In *Macassan History and Heritage: Journeys, Encounters and Influences*. M. Clark and S.K. May (eds). pp. 1-18. Canberra: ANU E Press.
- Clark, P. 2011. Monsoon traders lost on the Northern Australian coast – historical evidence for their existence. In *Proceedings on the Asia-Pacific Regional Conference on Underwater Cultural Heritage*. M. Staniforth, J. Craig, S.C. Jago-on, B. Orillaneda and L. Lacsina (eds). pp 399- 412.
- Clarke, A. 1994. Winds of Change: an archaeology of contact in the Groote Eylandt archipelago, Northern Australia. Unpublished PhD Thesis, Australian National University.
- Clarke, A. 2000a. Time, tradition and transformations: the negotiation of cross-cultural engagements on Groote Eylandt, northern Australia. In *The Archaeology of Difference Negotiating cross cultural engagements in Oceania*. R. Torrence and A. Clarke (eds). pp. 142-181. London: Routledge.
- Clarke, A. 2000b. The moormans' trowsers: Aboriginal and Macassan interactions and the changing

- fabric of Indigenous social life. In *East of Wallace's Line: studies of past and present maritime cultures of the Indo-Pacific region*. S. O'Connor and P. Veth (eds). pp. 315-35. Rotterdam: A.A. Balkema.
- Clarke, A. 2002. The Ideal and the Real: Cultural and Personal Transformations of Archaeological Research on Groote Eylandt, Northern Australia. *World Archaeology* 34(2):249-264.
- Clarke, A. and U. Frederick. 2008. The mark of marvellous ideas: Groote Eylandt rock art and the performance of cross-cultural ideas. In *Strangers on the shore: early coastal contacts in Australia*. P. Veth, P. Sutton, and M. Neale (eds). pp 148–164. Canberra, National Museum of Australia.
- Clarke, A. and U. Frederick. 2011. Making a Sea Change: Rock art, archaeology and the enduring legacy of Frederick McCarthy's research on Groote Eylandt. In *Exploring the Legacy of the 1948 Arnhem Land Expedition*. M. Thomas and M. Neale (eds). pp. 135-155. Canberra: ANU E-Press.
- Cook G.D., R.J. Taylor, R.J. Williams, and J.C.G. Banks. 2005. Sustainable harvest rates of ironwood, *Erythrophloeum chlorostachys*, in the Northern Territory, Australia. *Australian Journal of Botany* 53(8):821–826.
- Cowie, I., P. Short, B. Stuckey, B. Wirf, and D. Liddle. 2011. *Cycads in the Northern Territory*. Darwin: Northern Territory Herbarium, Department of Natural Resources, Environment, the Arts and Sport (NRETAS).
- Domanski, M. and J. A. Webb. 1992. Effect of heat treatment on siliceous rocks used in prehistoric lithic technology. *Journal of Archaeological Science* 19(6):601-614.
- Evans, N. 1992. Macassan loans in Top End languages. *Australian Journal of Linguistics* 12(1):45–91.
- Evans, N. 1997. Macassan loans and linguistic stratigraphy among the Iwaidjan languages. In *Archaeology and linguistics: Global perspectives on ancient Australia*. P. McConvell and N. Evans (eds.). pp. 237–259. Melbourne: OUP.
- Evans, N. 2002. Country and the Word: Linguistic evidence in the Croker Sea claim. In *Language in Native Title*. J. Henderson and D. Nash (eds.). Canberra: Aboriginal Studies Press. pp. 53-99.
- Evans, N. 2009. Doubled up all over again: borrowing, sound change and reduplication in Iwaidja. *Morphology* 19(2):159-176.
- Ganter, R. 2003. China and the beginning of Australian history. *The Great Circle* 25(1):3-19.
- Ganter, R. 2006. Turning the map upside down. *History Compass* 4(1):26-35.
- Ghosh, D. 2011. Mangroves: The most fragile forest ecosystem. *Resonance* 16(1):47-60.
- Gould, S.J. and N. Eldredge. 1993. Punctuated equilibrium comes of age. *Nature* 366(6452):223-227.

- Gregory, R. L. 1998. Aboriginal settlement patterns in the Ord-Victoria River Region. Unpublished PhD thesis, Department of Anthropology, Northern Territory University.
- Guse, D. L. 2006. Our Home our Country: A Case Study of Law, Land, and Indigenous Cultural Heritage in the Northern Territory, Australia. An unpublished Masters of Aboriginal and Torres Strait Islander Studies, Faculty for Aboriginal and Torres Strait Islander Studies, Charles Darwin University.
- Harris, J. 1985. Contact Languages at the Northern Territory British Military Settlements 1824-1849. *Aboriginal History* 9(2):148-169.
- Hauff, R.D., K.C. Ewel, and J. Jack. 2006. Tracking human disturbance in mangroves: Estimating harvest rates on a Micronesian island. *Wetlands Ecology and Management* 14(2):95-105.
- Hiscock, P. 2008. *The Archaeology of Ancient Australia*. London, Routledge.
- Holdaway, S., P. Fanning and J. Shiner. 2005. Absence of evidence or evidence of absence? Understanding the chronology of Indigenous occupation of western New South Wales, Australia. *Archaeology in Oceania* 40:33-49.
- Holliday, V. T. 2004. *Soils in Archaeological Research*. Oxford, Oxford University Press.
- Hua, Q. 2009. Radiocarbon: a chronological tool for the recent past. *Quaternary Geochronology* 4(5):378-390.
- Jull, A. J. T. 2007. Radiocarbon Dating: AMS Method. In *Encyclopaedia of Quaternary Science*. S. A. Elias (ed). pp. 2911-2918. Oxford Elsevier.
- Kathiresan, K. and Bingham, B.L. 2001. Biology of mangroves and mangrove Ecosystems. *Science and Technology* 40:81-251.
- Knaap, G. 2006. All about money: Maritime trade in Makassar and west Java, around 1775. *Journal of the Economic and Social History of the Orient* 49(4):482-508.
- Knaap, G. and H. Sutherland. 2004. *Monsoon Traders, Ships, Skippers and Commodities in Eighteenth-Century Makassar*. Leiden: KITLV Press.
- Lamilami, L. 1974. *Lamilami Speaks: The Cry Went Up. A story of the people of Goulburn Islands, North Australia*. Sydney: Ure Smith.
- Loch, C.H. and B.A. Huberman. 1999. A Punctuated-Equilibrium Model of Technology Diffusion. *Management Science* 45(2):160-177.
- Macknight, C.C. 1969. The Macassans: A study of the early trepang industry along the Northern Territory coast, Unpublished PhD Thesis, Australian National University.
- Macknight, C.C. 1972. Macassans and Aborigines. *Oceania* 42(4):283-321.
- Macknight, C. C. 1973. The nature of early maritime trade: Some points of analogy from the eastern part of the Indonesian Archipelago. *World Archaeology* 5(2):198-208.

Macknight, C.C. 1976. *The Voyage to Marege. Macassan trepangers in northern Australia*. Melbourne: Melbourne University Press.

Macknight, C.C. 1986. Macassans and the Aboriginal past. *Archaeology in Oceania* 21:69-75.

Macknight, C.C. 2008. Harvesting the memory: Open beaches in Makassar and Arnhem Land. In *Strangers on the Shore: Early Coastal Contacts in Australia*. In P. Veth, P. Sutton and M. Neale (eds). pp. 133–148. Canberra: National Museum of Australia.

Macknight, C.C. 2011 'The view from Marege': Australian knowledge of Makassar and the impact of the trepang industry across two centuries. *Aboriginal History* 35:121-143.

Macknight, C.C. 2013. Studying Trepangers. In *Macassan History and Heritage: Journeys, Encounters and Influences*. M. Clark and S. May (eds). pp. 19–40. Canberra: ANU E Press.

Macknight, C. C., and A.G. Thorne. 1968. Two Macassan burials in Arnhem Land. *Archaeology and Physical Anthropology in Oceania*, 3(3):216-222.

Máñez, K.S. and S.C. Ferse. 2010. The history of Makassan trepang fishing and trade. *PLoS One* 5(6):e11346.

Marshall, J. D., J. R. Brooks and K. Lajtha, K. 2007. Sources of variation in the stable isotopic composition of plants. In R. Michener and K. Lajtha (eds.) *Stable isotopes in ecology and environmental science, Ecological Methods and Concepts Series*. (Second Edition) pp. 22-60. Malden, Wiley/ Blackwell.

Stable isotopes in ecology and environmental science, 2d ed 2007, , Ringgold Inc, Portland.

May, S., P.S.C. Taçon, D. Wesley, and M. Travers. 2010. Painting History: Indigenous observations and depictions of the other in NW Arnhem land. *Australian Archaeology* 71:57-65.

May, S.K., P.S.C. Taçon and M. Pearson. 2011. Painted ships on a painted landscape. In *Exploring the legacy of the 1948 American-Australian scientific expedition to Arnhem Land*. M. Thomas and M. Neale (eds). pp.1-23. Canberra: ANU E-press.

McConvell, P. 1990. The Linguistic Prehistory of Australia: Opportunities for Dialogue with Archaeology. *Australian Archaeology* 31:3-27.

McIntosh, I.S. 1996a. Islam and Australia's Aborigines? A perspective from north-east Arnhem Land. *Journal of Religious History* 20(1):53-77.

McIntosh, I. S. 1996b. Can We Be Equal in Your Eyes? A perspective on reconciliation from north-east Arnhem Land. Unpublished PhD Thesis, Department of Anthropology, Northern Territory University.

McIntosh, I. S., 2006. A treaty with the Macassans? Burrumarra and the Dholtji Ideal. *The Asia Pacific Journal of Anthropology* 7(2): 153-172.

McIntosh, I.S. 2008. Pre-Macassans at Dholtji? Exploring one of north-east Arnhem Land's great conundrums. *Strangers on the Shore: Early coastal contacts in Australia*. In P. Veth, P. Sutton and M. Neale (eds). pp. 161–185. Canberra: National Museum of Australia.

McIntosh, I.S. 2011. Missing the Revolution! Negotiating disclosure on the pre-Macassans (Bayini) in North-East Arnhem Land. In *Exploring the Legacy of the 1948 Arnhem Land Expedition*. M. Thomas and M. Neale (eds.) pp337-354. Canberra. ANU E-Press.

McIntosh, I.S. 2013. Unbirri's pre-Macassan legacy, or how the Yolngu became black. In *Macassan History and Heritage: Journeys, Encounters and Influences*. M. Clark and S. May (eds). pp. 95-105. Canberra: ANU E Press.

McKinnon, J., D. Wesley, J.T. Raupp and I. Moffat. 2013. Geophysical investigations at the Anuru Bay trepang site: A new approach to locating Macassan archaeological sites in Northern Australia. *Bulletin of the Australasian Institute for Maritime Archaeology* 37: 106–112.

McWilliam, A. 2007. Harbours traditions in East Timor: Marginality in a lowland entrepôt. *Modern Asian Studies* 41(6):1113.

McWilliam, A., D. Bulbeck, S. Brockwell, and S. O'Connor. 2012. The Cultural Legacy of Makassar Stone in East Timor. *The Asia Pacific Journal of Anthropology* 13(3):262-279.

Mercieca, A. and P. Hiscock. 2008. Experimental insights into alternative strategies of lithic heat treatment. *Journal of Archaeological Science* 35(9):2634-2639.

Mitchell, S. 1994. Culture Contact and Indigenous Economies on the Coburg Peninsula, North western Arnhem Land, Unpublished PhD dissertation, Department of Anthropology, Northern Territory University.

Mitchell, S. 1995. Foreign contact and Indigenous exchange networks on the Cobourg Peninsula, north western Arnhem Land. *Australian Aboriginal Studies* 2:44-48.

Mitchell, S. 1996. Dugongs and dugouts, sharpsharks and shellbacks: Macassan contact and Aboriginal marine hunting on the Coburg Peninsula, north-western Arnhem Land. *Bulletin of the Indo-Pacific Prehistory Association* 2(15):181-191.

Morphy, H. 1991. *Ancestral Connections: Art and an Aboriginal System of Knowledge*. Chicago: University of Chicago Press.

Morphy, H. 1998. *Aboriginal Art*. London: Phaidon.

Morwood, M.A. and D.R. Hobbs. 1997. The Asian connection: preliminary report on Indonesian trepang sites on the Kimberley coast, NW Australia. *Archaeology in Oceania* 32:197–206.

Mowat, F. 1994. Size really does matter: factors affecting shell size fragmentation. In *Archaeology in the North: Proceedings of the 1993 Australian Archaeological Association Conference*. M. Sullivan, S. Brockwell and A. Webb (eds). pp. 201-212. Darwin: North Australia Research Unit, Australian National University.

Mowat, F. 1995. Variability in Western Arnhem Land shell midden deposits. Unpublished Masters Thesis, Department of Anthropology, Northern Territory University.

Mulvaney D. J. and J. Kamminga. 1999. *Prehistory of Australia*. Sydney: Allen and Unwin.

N'Dri, A.B., J. Gignoux, S. Barot, S. Konate', A. Dembe'le' and P.A. Werner. 2014. The dynamics of hollowing in annually burnt savanna trees and its effect on adult tree mortality. *Plant Ecology* 215:27–37

National Gallery of Australia Malawan Marika: Coming of the Macassan Traders Federation  
Australian Art and Society 1901-2001 <http://nga.gov.au/federation/Detail.cfm?WorkID=65617>  
Accessed 20/04/2014

National Library of Australia Axel Poignant Photographic Collection 5936

Needham, R.S. 1984. *Alligator River, Northern Territory; 1:250 000 Geological Series. Explanatory Notes. SD 53-1*. Canberra: Bureau of Mineral Resources, Geology and Geophysics Australia.

O'Connor, S., McWilliam, A., Fenner, J.N. and S. Brockwell. 2012. Examining the Origin of Fortifications in East Timor: Social and Environmental Factors. *Journal of Island & Coastal Archaeology* 7(2):200-218.

Ogden, J. 1981. Dendrochronological Studies and the Determination of Tree Ages in the Australian Tropics. *Journal of Biogeography* 8(5):405-420.

Olsen J., J. Heinemeier, K. M. Hornstrup, P. Bennike, and H. Thrane. 2013. 'Old wood' effect in radiocarbon dating of prehistoric cremated bones? *Journal of Archaeological Science* 40:30-34.

P.J. Reimer and R.W. Reimer. 2007. Radiocarbon Dating: Calibration, In S. A. Elias (ed) *Encyclopaedia of Quaternary Science*. pp. 2941-2950. Oxford Elsevier.

Purdy, B. A., and H. K. Brooks. 1971. Thermal alteration of silica minerals: an archaeological approach. *Science* 173(3994):322-325.

Putz, F.E. and H.T. Chan. 1986. Tree growth, dynamics, and productivity in a mature mangrove forest in Malaysia. *Forest Ecology and Management* 17(2):211-230.

Reimer, P. J., E. Bard, A. Bayliss, J. W. Beck, P. G. Blackwell, C. Bronk Ramsey, C. E. Buck, H. Cheng, R. L. Edwards, M. Friedrich, P. M. Grootes, T. P. Guilderson, H. Haflidason, I. Hajdas, C. Hatté, T. J. Heaton, D. L. Hoffmann, A. G. Hogg, K. A. Hughen, K. F. Kaiser, B. Kromer, S. W. Manning, R. W. Reimer, D. A. Richards, E. M. Scott, J. R. Southon, M. Niu, R. A. Staff, C. S. M. Turney, Jand . van der Plicht. 2013. Intcal13 and Marine13 Radiocarbon Age Calibration Curves 0–50,000 Years Cal BP. *Radiocarbon* 55(4):1869–1887

Romanelli, E. and M.L. Tushman. 1994. Organizational Transformation as Punctuated Equilibrium: An Empirical Test. *The Academy of Management Journal* 37(5):1141-1166.

Russell, D. 2004. Aboriginal-Makassan in the eighteenth and nineteenth centuries in northern Australia and contemporary sea rights claims. *Australian Aboriginal Studies* 1:3-17.

Sabherwal, R., R. Hirschheim, T. Goles. 2001. The Dynamics of Alignment: Insights from a Punctuated Equilibrium Model. *Organization Science* 12(2):179-197.

Schiffer, M. B. 1972. Archaeological Context and Systemic Context. *American Antiquity* 37(2):156-165.

Schiffer, M.B. 1983. Toward the Identification of Formation Processes. *American Antiquity* 48(4):675-706.

Schiffer, M. B. 1986. Radiocarbon dating and the 'old wood' problem: the case of the Hohokam chronology *Journal of Archaeological Science* (13):13–30.

Senior, B.R. and P.G. Smart. 1976. *Cobourg Peninsula-Melville Island, Northern Territory, 1:250 000 Geological Series explanatory notes*. Canberra: Bureau of Mineral Resources.

Sheets, P.D. 2002. *Before the volcano erupted: the ancient Cerén village in Central America*. Austin: University of Texas Press.

Spillett, P. 1989. Aboriginal and Makassan relationships. *The Beagle* 6(1):214–243.

Stein, J.K., J. N. Deo and L.S. Phillips. 2003. Big Sites—Short Time: Accumulation Rates in Archaeological Sites. *Journal of Archaeological Science* 30:297–316

Sutherland, H. 2000 Trepang and wangkang: The China trade of eighteenth-century Makassar c.1720s-1840s. In *Authority and enterprise among the peoples of South Sulawesi*. Tol, R., K. van Dijk and G. Acciaioli (eds.). pp. 451–472. Leiden: KITLV Press.

Swain, T. 1993. *A Place for Strangers: Towards a history of Australian Aboriginal Being*. Cambridge, Cambridge University Press.

Sweet, I.P., A.T. Brakel, L. Carson. 1999. The Kombolgie Subgroup - a new look at an old 'formation'. *AGSO Research Newsletter* 30:26–28

Taşon, P.S.C., S.K. May, S. Fallon, M. Travers, D. Wesley, and R. Lamilami. 2010. A Minimum Age for Early Depictions of Southeast Asian Praus in the Rock Art of Arnhem Land, Northern Territory. *Australian Archaeology* 71:1–10.

Taşon, P.S.C., J. Ross, A. Paterson and S.K. May. 2012. Picturing Change and Changing Pictures: Contact Period Rock Art of Australia. In *A Companion to Rock Art*. J. McDonald and P. Veth (eds.) pp. 420–436. New York: Wiley-Blackwell.

Taylor, R., J. Woinarski, C. Hempel and G. Cook. 2002. Ecological sustainability of timber harvesting in the Northern Territory. In *Ironwood Erythrophleum chlorostachys in the Northern Territory: aspects of its ecology in relation to timber harvesting*. R. Taylor (ed). An unpublished report to Agriculture, Fisheries and Forestry, Australia, Parks and Wildlife Commission, Palmerston.

Taylor, R.E. 2005. Radiocarbon Dating. In *Handbook of Archaeological Sciences*. D.R. Brothwell and A.M. Pollard (eds). pp. 23–34. Chichester, New York: J. Wiley.

Theden-Ringl, F., J. N. Fenner, D. Wesley and R. Lamilami. 2011. Buried on foreign shores: Isotope analysis of the origin of human remains recovered from a Macassan site in Arnhem Land. *Australian Archaeology* 73:41–48.

Thomson, D. 1949. *Economic structure and the ceremonial exchange cycle in Arnhem Land*. Melbourne: Macmillan.

Thomson, D. 1957. Early Macassar Visitors to Arnhem Land and their Influence on its People. *Walkabout* 23(7):29–31.

- Trudgen, R. 2000. *Why warriors lie down and die*. Darwin: Aboriginal Resource and Development Services Inc.
- Warner, W.L. 1932. Malay Influence on Aboriginal Cultures of north-eastern Arnhem Land. *Oceania* 2:476-495.
- Warner, W.L. 1937. *A black civilization: a social study of an Australian tribe*. New York: Harper and Brothers.
- Werner P.A. and L.D. Prior. 2007. Tree-piping termites and growth and survival of host trees in savannah woodland of north Australia. *Journal of Tropical Ecology* 23(6):611-622.
- Werner P. A., L. D. Prior, and J. Forner. 2008. Growth and survival of termite-piped *Eucalyptus tetrodonta* and *E. miniata* in northern Australia: Implications for harvest of trees for didgeridoos. *Forest Ecology and Management* 256:328–334.
- Wesley, D. 2013. Firearms in rock art of Arnhem Land, Northern Territory. *Rock Art Research* 30(2):235-247.
- Wesley, D. and M. Litster *in press* "Small, individually nondescript, and easily overlooked": Contact beads from rockshelters in the Wellington Range, north western Arnhem Land.
- Wesley, D., J. McKinnon and J. Raupp. 2012. Sails Set in Stone: A Technological Analysis of Non-Indigenous Watercraft Rock Art Paintings in North Western Arnhem Land. *Journal of Maritime Archaeology* 7(2):245-269.
- Woinarski, J, and B. Baker 2002 Biodiversity Audit – bioregional case study. Tiwi-Coburg bioregion, Northern Territory. Unpublished report to the National Land and Water Audit, Parks and Wildlife Commission of the Northern Territory.
- Woinarski, J., Beggs, K., Hempel, C., Price, O. and A. Fisher 2002a Ironwood: an ecological summary. In *Ironwood Erythrophleum chlorostachys in the Northern Territory: aspects of its ecology in relation to timber harvesting*. R. Taylor (ed). A report to Agriculture, Fisheries and Forestry, Australia.
- Woinarski, J., Beggs, K., Hempel, C., Price, O. and A. Fisher 2002b Distribution and biomass of ironwood in the Northern Territory. In *Ironwood Erythrophleum chlorostachys in the Northern Territory: aspects of its ecology in relation to timber harvesting*. R. Taylor (ed). A report to Agriculture, Fisheries and Forestry, Australia
- Woinarski, J.C.Z. and J. Westaway. 2008. Hollow formation in the *Eucalyptus miniata* – *E. tetrodonta* open forests and savanna woodlands of tropical northern Australia. Final report to Land and Water Australia (Native Vegetation Program). Project TRC-14.
- Woodroffe, C. 1988. Changing mangrove and wetland habitats over the last 8000 years, Northern Australia and Southeast Asia. In *Northern Australia: Progress and Prospects Volume 2: Floodplain Research*. D. Wade-Marshall and P. Loveday (eds). pp 1-33. Darwin: North Australia Research Unit, Australian National University.
- Woodroffe, C. 1993. Late Quaternary evolution of coastal and lowland riverine plains of Southeast Asia and northern Australia: An overview. *Sedimentary Geology* 83:63-175.



Woodroffe C.D. and J. Grindrod. 1991. Mangrove biogeography: the role of Quaternary environmental and seas-level change. *Journal of Biogeography* 18: 479-492.

Zazzo A., O. Munoz, J.-F. Saliège, C. Moreau. 2012 Variability in the marine radiocarbon reservoir effect in Muscat (Sultanate of Oman) during the 4th millennium BC: reflection of taphonomy or environment? *Journal of Archaeological Science* 39(7):2559-2567.

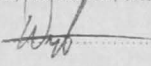
**Earthenware of Anuru Bay: A Re-assessment of Potsherds from a Macassan Trepang Processing Site, Arnhem Land, Australia And Implications For Macassan Trade And Trepang Industry.**

Authors: Daryl Wesley, Tristen Jones, Sue O'Connor, Jack Fenner, and William R. Dickinson.

Publication: Australian Archaeology

Current Publication Status: Accepted for Publication 29 May 2014

Coordinated and conducted the excavation and survey of Malara, Anuru Bay A, Macassan trepang site for fieldwork 2008-2010. Collated the all excavated and survey data for further analysis. Undertook basic classification of the entire Malara earthenware assemblage. Took this dataset and other datasets from the temper and fabric analysis provided by other contributors (Jones and Dickinson) and composed the overall question, background research, site description, discussion, and conclusion of this research paper.

Signed: 

Mr. Daryl Wesley

Assisted with the fieldwork collection of earthenware from Anuru Bay and thin section cutting and preliminary sorting of potsherds from Areas A and B according to fabric type temper and type and provided a written assessment.

Signed: 

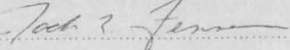
Ms. Tristen Jones

Australian Research Council Linkage Project LP0882985 Chief Investigator (CI) involved with assisting the coordination of fieldwork and participated in excavations at Malara, Anuru Bay A and continuing contribution to the ongoing project. As Project CI contributed to the topic development and editorial supervision for the research paper.

Signed: 

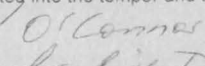
Professor Sue O'Connor

Assisted with mapping of the Malara, Anuru Bay A site during the 2009 and 2010 fieldwork seasons. Assisted with the development of the mapping data into maps for publication in this paper and editorial guidance and input.

Signed: 

Dr. Jack Fenner

Undertook the petrographic analysis of potsherd samples from Malara Anuru Bay A to confirm fabric and temper types and content. Also provided an assessment of the likely sources of the temper sands from Indonesia. Provided a short written assessment of the potsherd analysis incorporated into the temper and type analysis.

Signed:   
for Bill Dickinson. Dickinson is in the US but not available to sign - no e-mail contact.

Dr. William R. Dickinson

# Earthenware of Malara, Anuru Bay: A reassessment of potsherds from a Macassan trepang processing site, Arnhem Land, Australia, and implications for Macassan trade and trepang industry

Daryl Wesley<sup>a</sup>, Tristen Jones<sup>a</sup>, Sue O'Connor<sup>a</sup> and William R. Dickinson<sup>b</sup>

(a) The Australian National University, Archaeology and Natural History

(b) Department of Geosciences, University of Arizona, Arizona 85721, USA.

Keywords: Macassan, pottery, earthenware, trepang processing, Anuru Bay, Goulburn Island, Arnhem Land, contact archaeology, Northern Territory, Australia

## Abstract

Earlier excavation at Malara (Anuru Bay A), the Macassan trepang processing site, in Arnhem Land, produced a substantial quantity of earthenware pottery (Macknight 1969) and pottery has been reported and collected from Macassan sites elsewhere on the Northern Territory and Kimberley coastlines. Although several studies have been undertaken on earthenware from Macassan sites it was uncertain whether any of these studies included sherds from the archaeologically significant Anuru Bay site. This paper details the results of the analysis of earthenware sherds recovered during a recent programme of excavation and surface collection at the site. The earthenware was analysed in order to investigate its source and whether one or more regions of manufacture were evident. Our results indicate that the sole source for all the pottery in the analysed sample was likely South Sulawesi. It would appear that the trepang fishing fleets who camped at Malara provisioned non-perishables, such as local earthenware, at the port of Makassar prior to beginning their voyage to Marege. It also strengthens claims for Makassar as the major operating port for the fleets operating in the Anuru Bay area.

## Introduction

Recent archaeological research in Arnhem Land has sought to investigate and refine the timing of culture contacts between Indonesians, Europeans and Aboriginal communities in northwest Arnhem Land, with a particular focus on the coastal region to the north of the Wellington Range and the Goulburn Island group (FIGURE 1) (May et al. 2010; Taçon et al. 2010; Theden-Ringl et al. 2011; Wesley et al. 2012). The Malara complex (previously Anuru Bay A) in Anuru Bay comprises a collection of Macassan stone lines and associated deposits which include marine shell, charcoal, earthenware pottery sherds, bone, and sparse ceramics, glass and metal artefacts and fragments (Macknight 1969). These archaeological features attest to either long, non-intensive, or short, intensive, periods of occupation, possibly catering for a substantial number of trepang fishermen (Macknight 1969:231–236). Macknight (1976) claimed that Malara was one of three foremost centres of Macassan economic activity along the Arnhem Land coastline, although there are no corroborating historical observations attesting to this practice.

Although several studies have been undertaken on earthenware from Macassan sites in Arnhem Land (Key 1969; McCarthy and Setzler 1960; Rowley 1997), it was uncertain whether any of these studies included sherds from Anuru Bay. McCarthy and Setzler's (1960) collection was made during the Anglo-American Scientific Expedition to Arnhem Land (AASEAL) and was derived from a number of different coastal locales in eastern Arnhem Land. Rowley's (1997) sample was derived from a random surface collection made around Goulburn Island by the Rev. Lazarus Lamilami in 1964 and provided to the anthropologists Ronald and Catherine Berndt (Lamilami 1974). The analysis undertaken by Key (1969) on sherds collected by Macknight did not specify the

location of the sites sampled. For the current study it was important to establish a temper and fabric classification specific to the Malara site in order to compare it with the samples analysed by Rowley (1997) and Key (1969) and any earthenware sherds that might be recovered from Indigenous archaeological sites in the Wellington Range.



Figure 1. Malara (Anuru Bay A) and other archaeological sites in the Wellington Range, Arnhem Land (map produced by CartoGIS ANU).

These earlier studies suggested that, while most of the earthenware appeared to derive from a single source and that this was compatible with historic pottery manufactured in South Sulawesi, a small number of 'fine' earthenware sherds were noted to be different to the coarser earthenware that comprised the majority of the assemblages (Key 1969:105). This raised the possibility that some of the pottery may have been sourced outside of South Sulawesi. Mariners from Makassar have been termed 'Monsoon Traders' by Knaap and Sutherland (2004) and it seemed plausible that some of the earthenware found on their sites may have been acquired by the crews trading en-route to Australia (Bulbeck and Rowley 2001; Macknight 1976; Rowley 1997).

Macknight (1969:199) collected 17 kg of earthenware pottery from the surface of the Malara site. Subsequently he excavated 155 m<sup>2</sup> (or 2.5% of the site by his calculation) and recovered a further 18 kg of potsherds from the excavation (Macknight 1969), making a total of 35 kg of earthenware potsherds from the Malara site. In addition to the earthenware, Macknight (1969:231) recovered other materials, including Chinese ceramics, five glass beads, green glass bottle fragments (some lettered), clear glass fragments, iron nails, a lead ball, iron fragments, iron spikes, fish hooks, brass wire, an iron knife blade, a piece of iron cauldron, a copper disc, a needle, a bronze ring, and an iron clip. Although the Malara assemblage displays a relatively high diversity of artefact types, aside from earthenware, there were relatively few of these artefacts compared with Goulburn Island.

Macknight (1976) suggested that the differences in proportional representation of exotic goods might be due to temporal differences in the occupation of the two sites, and raised the possibility that Anuru Bay might have been occupied during an earlier period when fewer Dutch, Chinese and European goods were making their way into the markets of Makassar. Macknight's (1976, 2008, 2013) dating of the use of the stonelines produced radiocarbon ages which he dismissed as too old based on the historic evidence for Macassan trepang exploitation.

New excavations and surface collections were undertaken at the Malara site between 2008 and 2010. The principal aims of the new excavations were to gain a better understanding of chronology of Macassan visitation and to collect a sample of earthenware to test earlier interpretations regarding origin and diversity of pottery. We excavated a sample of 13 m<sup>2</sup>, the equivalent of 8% of

the area excavated by Macknight (1969:199), with all sediments screened through a 3 mm sieve. A further surface collection was conducted over 121 m<sup>2</sup> of the site. The issue of the chronology of Macassan visitation to the Arnhem Land coast is complex and is dealt with elsewhere (Clarke 2000; Clark and May 2013; May et al. 2010; Taçon et al. 2010; Theden-Ringl et al. 2011; Wesley et al. 2012). Here we focus on resolving the origin of the earthenware pottery from the Malara site, Anuru Bay.

### **Nature of the Macassan Trade and Commerce**

It is important to establish some details regarding the nature of the Macassan maritime industry and the possible multiple sources of earthenware pottery that was an integral part of the material culture aboard the trepang fleets. The nature of the Macassan trepang industry in Sulawesi, and the exploitation of this resource in northern Australia, have been discussed and described in great detail (Berndt and Berndt 1954; Bowdler 2002; Bulbeck and Rowley 2001; Clark and May 2013; Clarke 1994, 2000; Ganter 2003, 2006; Macknight 1969, 1972, 1973, 1976, 1986, 2008, 2013; Máñez and Ferse 2010; Mitchell 1994, 1996; Mulvaney and Kamminga 1999; Rowley 1997; Russell 2004; Sutherland 2000; Trudgen 2000; Warner 1932, 1937). What is important for this study is Watson-Andaya's (2006:675) remark that, surprisingly, the edible *Holothuria* sp., sea slug, known as *trepang*, has required scholars to 'think far beyond area-studies boundaries and serves, if we need it, as another reminder of the great lengths to which human beings will go to satisfy the demands of commerce.' It is also important to note that the trepang industry was tethered to the complex South East Asian maritime economy driven largely by China, but also involved an ancient inter-island trading system throughout eastern Indonesia (Junker 2002; Sutherland 2000). Makassar was notable as being at the intersection of local

Sulawesi maritime traffic and inter-island maritime movement through Java, Kalimantan, Maluku, Nusa Tenggara and the Philippines, as well as in long distance trade with Europe, India and China (Máñez and Ferse 2010:1) (FIGURE 2). Expansion of the trepang industry in the 18<sup>th</sup> century was based on the need to supply growing demand from late Ming Dynasty China. The industry for the eastern Indonesian archipelago was centralised through the trading port of Makassar (Watson-Andaya 2006:676). During the 18<sup>th</sup> and 19<sup>th</sup> centuries there were significant shifts in the fortunes of trade, and imports and exports that involved the port of Makassar very likely influenced the size, timing and composition of the trepang fleets visiting northern Australia (Knaap 2006; Máñez and Ferse 2010; Poelinggomang 1993; Sutherland 2000, 2001, 2010).



Figure 2. Island South East Asia illustrating Macassan links to Australia (after Blair and Hall 2013:212; Knaap and Sutherland 2004; Morwood and Hobbs 1997:198; Russell 2004:8; Sutherland 2000) (map produced by CartoGIS ANU).



South East Asian trepang commerce is generally considered to be the major driver for any expansion towards the Australian coast by Indonesian seafarers largely arising during the 18<sup>th</sup> century (Macknight 2008). On the other hand, Grave and McNiven (2013), McIntosh (2008) and Bowdler (2002) proposed that there may have been other economic, political, social, and accidental mechanisms that influenced maritime travel to northern Australia and the Torres Strait Islands so it is conceivable that the northern coastline of Australia was visited prior to the expansion of the trepang industry. Certainly the trade and commerce carried out through Makassar involved a high level of complexity and was undertaken by multiple ethnic groups (Chinese, Malays, Bugis, Sulawesi locals), and considerable volumes of materials of great diversity passed in and out of this port (Máñez and Ferse 2010; Sutherland 2000, 2001, 2010). Control and rights over the volume of trepang flow through Makassar was a very lucrative business (Sutherland 2010). According to Sutherland (2000:93), the trepang commerce of Makassar expanded greatly during the 18<sup>th</sup> and early 19<sup>th</sup> centuries, both in volume and value. Sutherland (2000:94) noted that:

Porcelain, earthenware, metal goods, textiles and knick-knacks from China, textiles and later opium from India, were exchanged for trepang and other sea and forest products, flowing back to increase both supply and demand in maritime communities. The points of connection and supply were not fixed; Makassar enjoyed a long period of centrality, but later lost business to Singapore and Sulu. Despite such shifts, however, the movement of commodities continued, and the long-term effects of trade lay more in the structural development of new relationships and needs than in localized prosperity or decline.

Mitchell (1994) researched government customs records and found a declining trend in Macassan visitation to Arnhem Land during the 19<sup>th</sup> century which was influenced by market fluctuations, domestic crises in China, and introduction of customs duties between 1882 and 1906 by Australian governments. Following the introduction of the customs levy there was a requirement for Macassan

prau captains to obtain documentation from Dutch authorities in Makassar (Mitchell 1994; Powell 1988) (Figure 3). After 1882, Australian records show that there was a significant decrease in trepang fleet numbers and that all the fleets that made it to Australia originated from the port of Makassar (Mitchell 1994:36). Before 1882 there were no regular records kept and it is possible that members of crews and/or ships in the trepang fleets originated from other destinations in eastern Indonesia, including Sumbawa, Moluccu and Aru, where other maritime communities were engaged in trepanging and other commerce.

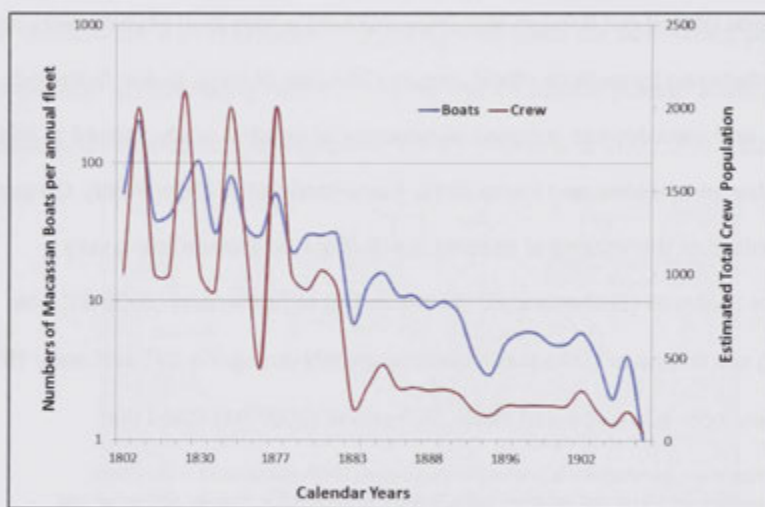


Figure 3. Data illustrating the fluctuations and decline in Macassan visitation in the 19<sup>th</sup> century (Mitchell 1994:36).

Macassan fleets left for Australia on the trade winds in the early wet season travelling via other islands such as Timor. Clark (2006) stated that the Macassan sailing, trade and commerce was usually undertaken on a seasonal basis, travelling to Melville Island at the start of the season and moving eastwards, then returning west to the Coburg Peninsula or Melville Island before travelling north again to Sulawesi (see Figures 1 and 2). As the trepang

harvest was undertaken during a season of storms, monsoon rain and severe tropical cyclones, fleets made for the protected embayments of the Arnhem Land coast, established base processing camps, and split up to exploit various sections of the coastline. While Macassans were noted during the 19<sup>th</sup> century in many places along the Arnhem Land coastline, there are very few references to their presence in the vicinity of Goulburn Islands and Anuru Bay during the 1800s. Alfred Searcy recorded only one encounter with Macassans at Goulburn Island in 1885 when he '... arrived Goulburn Island 21 January 1885 and found three praus which were all found with licences and all regular' (*Northern Territory Times and Gazette* 1885:3). On another occasion he encountered two praus operating a dredging canoe from Sims Island located between South Goulburn Island and the mainland (Searcy 1909:80). Macknight's (1969:199) extensive research of historical records also failed to find any documentary reference to Macassans at Anuru Bay. For such a large trepang processing site to go unnoticed by Europeans in the 19<sup>th</sup> century is a significant omission in the historical record. Therefore it is likely that the use of Anuru Bay as a major trepang processing centre may well pre-date the mid-19<sup>th</sup> century European expansion and settlement of the region.

### **Earthenware in Northern Australia**

The presence of earthenware and ceramic potsherds was noted in early anthropological work in Arnhem Land (Berndt 1954; Berndt and Berndt 1947; Thomson 1949), with the first anthropological reports of pottery being those of Warner (1937). The Berndts' noted that there were large numbers of earthenware sherds in coastal Arnhem Land and surrounds, noting references to pottery and pottery manufacturing in Indigenous songs, and recording some sherds and information about them from their Aboriginal informants (Berndt and

Berndt 1947; Berndt 1954). The provenance of the pottery was attributed to the port of Makassar, supported by the presence of historically recorded trepang processing camps in northeast Arnhem Land. However, according to the Berndts, their Aboriginal informants told them that pottery was also produced in Arnhem Land with the assistance of the local Indigenous communities and using material from termite mounds. This claim was refuted by later researchers, with petrological studies showing potsherds collected from Macassan trepang sites exhibited a distinctive non-Australian geological signature (Key 1969; Macknight 1976; Rowley 1997).

Putting aside the Australian origin hypothesis, there is still significant information regarding Indonesian pottery to be gleaned from the Berndts' (1947, 1954) ethnographic work with the Yolngu at Yirrkala. Aboriginal informants were able to identify 62 different aspects of Macassan material culture, activities associated with sailing, trepang processing and cooking (Berndt Museum records 7152, 7249, 7246, and 7164). Using crayon drawings, Yolngu informants recorded detailed descriptions of items that were brought with the Macassan trepang fishermen. For example, Drawing 7152 is labelled with the following description:

This drawing depicts in plan view a Macassan trepang processing site at Melville Bay, near Yirrkala, north-eastern Arnhem Land. Praus are sailing in the large harbour, and various Macassan settlements are shown on the shores. Islands are a feature, with a central peninsula which was the principal residential area of the traders. Here is a hut built on stilts surrounded by trepang-boiling pots, the ashes from curing fires, a spoon, bottles of liquor, a length of bamboo, an axe and various knives (Berndt Museum records 7152).

Personal items described by Yolngu informants from Item 7249 included a water jug (*Boidjung*), bamboo containers, bottles, pots (*Malara*), plates (*Bani*), coloured plates (*Lambang*) and a flat tray/plate (*dendanga*). The table below lists

other language words recorded from items 7246 and 7163 that illustrate different types of earthenware vessels were discriminated by the Berndt's Yolngu informants, including porcelain plates (i.e. coloured plates) and other imported materials (Table 1). The depth of the penetration of Indigenous knowledge and use of earthenware is further supported by Evans (1992:69) who published an extensive list of loan words originating from Makassarese, Malay, and Bajau. Evans (1992:66-88) found evidence within numerous Arnhem Land Indigenous languages loanwords that related to trepang and food preparation, including containers.

Table 1. Further Yolngu words for Macassan pottery and food-related material culture recorded by the Berndts' (Berndt Museum Collection 7246 and 7163).

General Items Identified	Yolngu Word
earthenware pots for drinking	<i>budjung</i>
bottles (wine/spirit)	<i>budalu</i>
pot (rice cooking)	<i>Gawa</i>
Jug	none known
earthenware jar	<i>bodalu, or garumbal</i>
iron bucket	<i>yimbari</i>
earthenware pot	<i>wari</i>
coloured plates	<i>bani</i> (lambang design)
Boxes	<i>Badi</i>
Bamboo	<i>woiyung</i>
hard wax, on the stopper of the bottle	<i>Damara</i>

The first major study of earthenware and ceramics recovered from Macassan sites was undertaken by McCarthy and Setzler (1960). They collected 'hundreds' of earthenware potsherds from Winchelsea Island and various beach locations along the east Arnhem Land coastline during the 1948 Anglo American Scientific Expedition to Arnhem Land (AASEAL) (Clarke and Frederick 2011; Mulvaney 1996). Analysis of a sample of these potsherds concluded that they were of a type common across Indonesia and could date

anywhere from 208 BC to 906 AD (reported in Clarke and Frederick 2011:135).

No further research has been conducted on the AASEAL pottery, Chinese porcelain or stoneware sherds.

Of the pottery that he excavated from Macassan trepang sites, Macknight (1969:290) found the earthenware to derive from common globular, spherical pots, including some with additional lids, handles and decorative elements. He described the exteriors as smooth and well finished, with the body wall away from the rim typically comparatively thin (Macknight 1969:290). Macknight (1969:293) also noted the presence of a reddish-brown slip or paint on some sherds, though at times weathering made it difficult to distinguish.

To test the Berndts' theories about Indigenous production in Arnhem Land, Macknight (1969:133–138) had Key (1969) undertake a petrological examination of the collection. Key (1969) thin-sectioned and examined the mineralogy of 20 sherds, but unfortunately, he did not specify from which sites they originated. Nineteen of the 20 samples contained the same mineral inclusions, all components of andesitic ash: feldspar, pyroxene, brown hornblende, biotite and occasional sherds of glass, limonite and rock fragments (Key 1969:105). In view of these results, he also confirmed that the earthenware was foreign to Australia and suggested that the raw material source was consistent with the recent andesitic volcano of Lompobatang in southwest Sulawesi (Key 1969).<sup>1</sup>

---

<sup>1</sup> Volcanic activity in Sulawesi has been occurring over the last 45 million years, with more vigorous volcanism occurring at 10 mya which dominates the southern arc of Sulawesi and its current geological and geomorphological structure (Hall 2009:152). Although geologically complex, southern and northern Sulawesi are generally considered to be dominated more by volcanism, whereas west Sulawesi emerged from different geological processes (Hall 2009:159). Islands to the south of the Java-Sulawesi arc are largely formed from Quaternary reefs, providing differentiation in eastern

The results also revealed that, while there was mineralogical homogeneity, the potsherds differed in the amount of silt within the fabric. Key (1969) proposed that, although the earthenware contained the same volcanic temper, there were two separate clay types used in pot production. The second type had a 'finer' fabric, and is sometimes referred to as 'fine ware' (Rowley 1997). A single potsherd contained hornfels, and Key (1969) proposed that this pot was possibly obtained en-route to Australia, such as in the Kei Islands.<sup>2</sup> Key's analysis was largely supported by the only other petrological analysis conducted to date, by Rowley (1997:96).

Rowley (1997:12–15) conducted petrological examination of sherds from two earthenware assemblages associated with Macassan stonelines: 500 sherds excavated by Ian Crawford from the Tamarinda site in the north Kimberley, and 481 sherds from Goulburn Island provided to the Berndts by Lazarus Lamilami (1974) and now housed in the Berndt Museum. Rowley (1997:12–15) also acquired historical sherds dating from the 16<sup>th</sup>, 18<sup>th</sup> and 19<sup>th</sup> centuries from southwest Sulawesi from David Bulbeck, in addition to a control sample of contemporary pot sherds from Makassar. Rowley (1997:27–28) examined 28 thin-sections using energy dispersive spectrometer (EDS) microanalysis, including clay matrix analysis and production technique analysis, and 74 thin-sections for temper analysis using a polarising microscope. Rowley (1997) used an EDS attached to a scanning electron microscope (SEM) to assess the

---

Indonesia between volcanic geologic islands and those dominated by limestone (Hall 2009:156).

<sup>2</sup> Historically the Kei Islands were known for pottery manufacturing and as suppliers of the western Indonesian region (Key 1969:106).

chemical composition of the clay matrix, thus aiding the deciphering process between naturally occurring minerals within clay fabric and added mineral temper<sup>3</sup>.

Rowley's (1997) Goulburn Island results were indicative of the use of volcanic andesitic raw material, with two distinct earthenware types distinguished. The first contained lithoclasts and discrete crystal grains in varying proportions, while the second contained a high frequency of lithoclasts and phenocrysts of feldspar and pyroxene, and minute quantities of hornblende, biotite, altered biotite, iddingsite and brown clay (Rowley 1997:96). Quartz was noted to be present, though was not included in the findings as the mineral source could not be used as a diagnostic factor (Rowley 1997:96). Temper analysis of the Goulburn Island sherds produced identical mineral signatures to both the historical and contemporary Sulawesi control sherds, although the minerals differed in quantity and size. Rowley (1997) noted that there were two exceptions: sherds G165 and G11 contained finer-grained temper with no lithoclasts and only grains of feldspars, pyroxenes and hornblende. She suggested that these differences could be a result of vessel production methods rather than a different source, and that these sherds might be the same as the 'fine earthenware' described by Key (1997:150–151).

Rowley (1997) also analysed ceramic form, decoration and ethnographic evidence of potting in Sulawesi to investigate the amount of variability which could arise from differences in manufacturing techniques. She concluded that the Goulburn Island collection could consist of two distinct types of wares: the first using a coarser clay fabric with volcanic andesitic mineral temper

---

<sup>3</sup> Earthenware is fired at a wide range of temperatures, but usually between 900-1200°C, determining minimal chemical changes.



inclusions, and the second using a 'finer' clay fabric but also containing a volcanic andesitic mineral temper. She concluded that the sherds in the Goulburn Island collection could all derive from Makassar, and that the variability in the fabric and in the proportional representation of mineral inclusions might result from differences in local source areas for clay collection coupled with differences in manufacturing techniques.

Rowley's pottery from the Kimberley site Tamarinda also fell into two groups. The first, Tamarinda Group 1, was friable and porous and had a calcareous shell temper and was therefore very distinct from all the volcanic tempered earthenware studied. Crawford (1969:345) suggested that this pottery might have come from the Kei Islands, however Rowley (1997: 146) thinks the poor quality of this pottery makes the Kei Islands an unlikely source. She concludes that the clay and temper in this pottery would be compatible with many of the islands in Indonesia but whatever the source they demonstrate that the trepang fleets using the Tamarinda site acquired pottery manufactured outside Makassar. Tamarinda Group 2 was volcanic tempered and while there was some variability in this group Rowley thinks it likely that all of these pots were sourced from Makassar during the 18<sup>th</sup> to 19<sup>th</sup> century based on the comparative archaeological assemblage from Sulawesi from that time period (1997: 147-49).

### **The Malara Site in Anuru Bay**

Anuru Bay is a shallow harbour located approximately 280 km east of Darwin on the coast of northwest Arnhem Land (Figure 1). The area mostly comprises Quaternary regolith consisting of sand, silt, carbonate sediment and ferruginous laterite, the distribution of which reflects the complex environmental evolution of

the area since sea level stabilisation ca 6000–8000 BP (Needham 1984; Senior and Smart 1976; Sweet et al. 1999). The coastal and estuarine plains developed mainly on estuarine sediments deposited in drowned river valleys and embayments that are seasonally inundated during the annual wet season. The bay is surrounded by Holocene sand dunes, sandy spits, rocky promontories, claystone cliffs and mangroves.

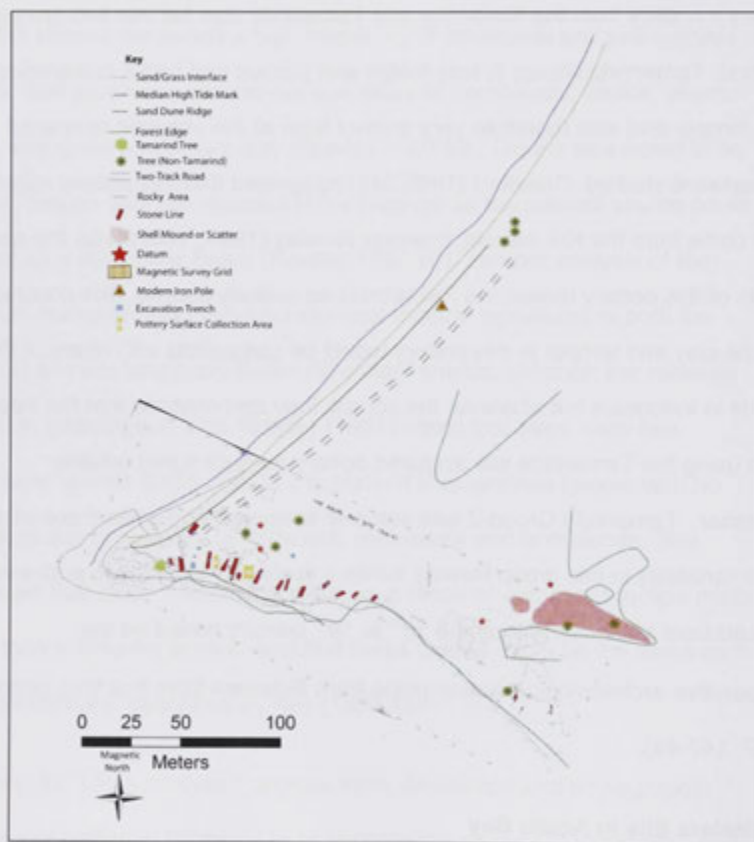


Figure 4. Malara (Anuru Bay A) showing archaeological features and areas of investigation in 2009–2010, with Macknight's (1969) map overlaid (map by Jack Fenner).

The Macassan trepang processing site known locally as Malara is located on a late Holocene sand and shell grit promontory built-up over a silt-clay rich sandstone that outcrops on the point. The northern side of the peninsula is fringed by an open sandy beach, while its southern side was formally a sandy beach but is now covered by extensive intertidal mangroves (Janelle Stevenson pers. comm.). The changeover point between these two environments, at the peninsula's furthest western point, is distinguished by a rocky shoal outcrop and a tamarind tree. From the water's edge the land transforms to a sand dune ridge on a steep incline. Beyond the sand dune to the north is sparsely vegetated, with open savannah woodland consisting of eucalypts, low dense coastal scrub in places, and with fine medium to tall grasses (*Sorghum intrans*). It is on the south-facing incline of the dune that the Macassan trepang site is located. A shell midden lens is present on the crest of the dune, with general scatters of *Anadara granosa* and *Telescopium telescopium* in varying densities across the site.

The site contains a total of 21 trepang processing stonelines, some of which are now buried, running in a south-southwesterly to north-northeasterly direction (Figure 4). The stonelines comprise parallel lines of heaped and broken sandstone boulders, with some secondary lines protruding horizontally from the main central line forming 'cooking bays'. The area surrounding the stonelines contains a collection of pottery sherds, shell and other faunal remains. Nearby Macassan features include stone arrangements, burials, wells, and artefact scatters.

In 1982 archaeologists from the Museum and Art Gallery of the Northern Territory flew over the site and reported that the stonelines were visible from the

air and in an excellent state of preservation (Baker 1984), but since then the site has suffered significant surface erosion in places and disturbance from feral animals, mainly pigs. Malara is in an area where there are high levels of contemporary use by local Traditional Owners for fishing, resource gathering and camping, with vehicles frequently driven over the western half. It contains a moderate density of modern glass, metal and organic debris, which is concentrated in the southeast portion of the site. The peninsula can be subject to extreme weather, particularly wind and monsoonal rains in the wet season, and has very little natural protection from extreme weather events (e.g. Cyclone Monica in 2006). This has caused previously sub-surface material to be exposed, revealing scatters of potsherds between several of the stone lines.

#### ***Surface Collection Areas A and B and Earthenware Sampling 2008 - 2010***

During the 2008 to 2010 fieldwork a collection of earthenware was made from two areas of the Anuru Bay site, Areas, A and B (Figure 5; Table 2). Areas A and B were selected using different stonelines as area perimeters, as these were the largest and best preserved within the Anuru Bay site complex and a considerable amount of surface erosion had uncovered a high quantity of potsherds. The method of collection was determined by establishing a gridline and conducting transects at 1 m intervals from the south-southwest to north-northeast. When a potsherd was observed its location was flagged, and the square was mapped and visually inspected for additional finds. These areas were subsequently marked with a grid square identification number, and all sherds within the square were then recorded, bagged and labelled. Collection Area A was located between Stonelines 4 and 5. Stoneline 4 is 7 m long with a width of 1.3 m. Stoneline 5 is 8.3 m long and has a width of 1.8 m. Stonelines 4 and 5 are moderately disrupted lines of locally outcropping silt and clay rich

sandstone. Collection Area A was 38.18 m<sup>2</sup> in size. Area B was selected between Stonelines 3 and 4. Stoneline 3 is 8.4 m long with a width of 1.3 m. Stoneline 3 is a relatively discrete line of stone, whereas Stoneline 4 is a more disrupted linear scatter of stone. Area B measured 83.16 m<sup>2</sup>. All sherds recovered from collection Areas A and B were assigned a sample identification of Area-Square-Sequential Sherd Number.

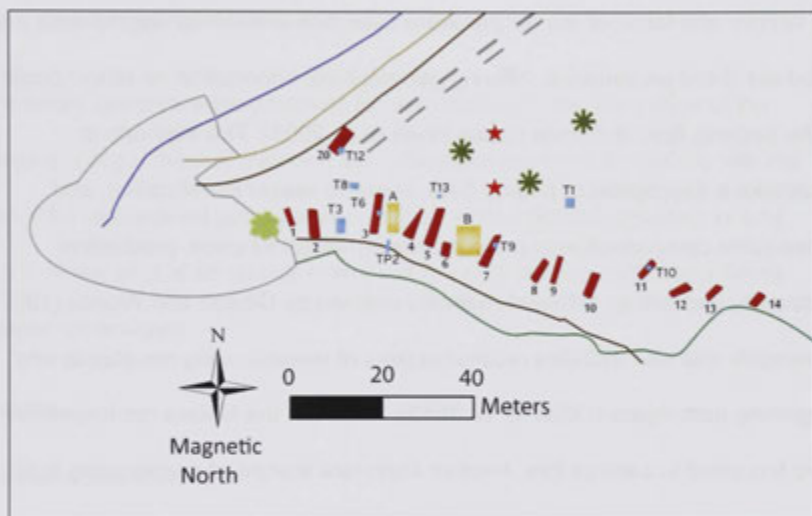


Figure 5. Malara illustrating stonelines, excavation trenches, and pottery collection Areas A and B (Map by Jack Fenner)

Table 2. Surface collection of earthenware potsherds.

Area	Area Size m <sup>2</sup>	Number of Sherds	Density
Total A	38.18	41	1.07/m <sup>2</sup>
Total B	83.16	47	0.56/m <sup>2</sup>
Total	121.34	88	0.72/m <sup>2</sup>

## Pottery Identification Methodology

Descriptions of form and decoration, categorising finds according to temporal chronology, and assessing production and distribution patterns, all form the basis for a comprehensive archaeological ceramic analysis, and have been completed in several earlier studies (Macknight 1969; Rowley 1997). The primary objective for this project was to undertake a preliminary assessment of the temper and fabric of the earthenware collection in order to acquire data that could aid sherd provenance, offering geographical information on ethnic origin of the trepang fleet and trade routes (Veth et al. 2005). The methods to undertake a description of pottery form, sherd to vessel identification, and subsequent categorisation to provide data on vessel function, production technique, and dating followed methods outlined by Gibson and Woods (1997). Commonly this also includes reconstructions of vessels using rim sherds and conjoining techniques (Orton et. al. 2013), however, the Malara rim fragments were too small to attempt this. Another important feature of earthenware is to note the whether the core margins are sharp or diffuse (Orton et al 2013:154). This provides information about whether oxidised organics were present in the clay and whether the earthenware was cooled rapidly in the air after firing (Orton et al 2013:154). These are important factors in the analysis of local earthenware production in island Indonesia.

Pottery recovered from Malara was initially classified using the following identification principles (after Sinopoli 1991). The individual sherds prepared for analysis were inspected using a polarising microscope at magnifications of 25x and 40x. Noted information included:

- A description of fabric observing colour and clay particle size;

- A description of temper noting inclusions, frequency, size, sorting and roundness and,
- Allotment to a 'preliminary category' according to fabric and temper,
- Recording the sharpness and diffuseness of core margins
- Recording of surface features, including decoration, slip and glaze, production marks such as moulding, coiling, wheel thrown marks or paddle and anvil markings;

The sherd samples were prepared for microscopy by the truncation of the samples using a manual diamond saw. Samples too small for cutting with the saw or for subsequent petrographic analysis were rejected, resulting in only 33.5% of the total of 88 sherds from Area A and B surface collections being suitable for analysis.

## **Results**

### ***Surface Collections***

The breakdown of the potsherd collection per square is given in Table 3 for total surface collections and excavation squares is very small in comparison to the amount of earthenware collected by Macknight (1969). The earthenware potsherd sample surface collection totalled 88 sherds: 41 from Area A, and 47 from Area B. A further 65 (623.3g) potsherds were collected within the broad site location and located individually located with total station coordinates. These sherds helped to give a better understanding of the range of pottery but they were not used for subsequent analyses as they were not recovered from a controlled sample area.

## Excavation

The amount of earthenware and other material culture from Malara was significantly less abundant and diverse than that recovered by Macknight (1969, 1976) and consisted mostly of earthenware potsherds ( $n = 301$ ; 1.3kg) (Table 3). There were two sherds of blue on white Chinese porcelain (1.9 g) and three sherds of stoneware (8.9 g). No glass, beads, metal objects or metal (i.e. lead or iron) fragments were recovered from the excavations or surface collection. A silicified sandstone flake, silcrete unifacial point and dolerite flake were the only Indigenous artefacts recovered from the excavations. Trench 13 contained the highest proportion of the excavated earthenware assemblage. The total amount of earthenware recovered from the excavations weighed only 389.4 g ( $n = 148$ ). The excavated earthenware assemblage was highly fragmented, with an average potsherd weight of 4.2 g (median 1.8 g; sd 10.45) and a range of 121.1–0.1 g.

Table 3. Total earthenware potsherds recovered from excavations and surface collection.

SQUARE	No. of sherds	Weight (g)
1	3	4.1
3	39	91.8
4	5	47.5
8	16	60.3
9	2	44.4
12	7	29.8
13	75	106
SL17	1	5.5
Surface Finds	65	623.3
Area A	41	91.2
Area B	47	196.6
TOTAL	301	1300.5



## Potsherd Analysis

The majority of the 148 potsherds from the Malara excavation were small, non-diagnostic fragments (82.4%). Potsherds that could be identified consisted mostly of body ( $n=25$ ) and rim ( $n=23$ ) sherds. Only eight sherds displayed distinguishable patterns, these being paddle impressions ( $n=2$ ), line impressions ( $n=1$ ), applied patterns ( $n=2$ ) and incised lines ( $n=3$ ). Earthenware breakage is likely to have been exacerbated by the contemporary Traditional Owner use of the site when compared with the late 1960s. Figure 6 is the section profile from Trench 8, which is located in this high traffic area, and illustrates areas of soil disturbance compared to the stratigraphy recorded by Macknight (1969).

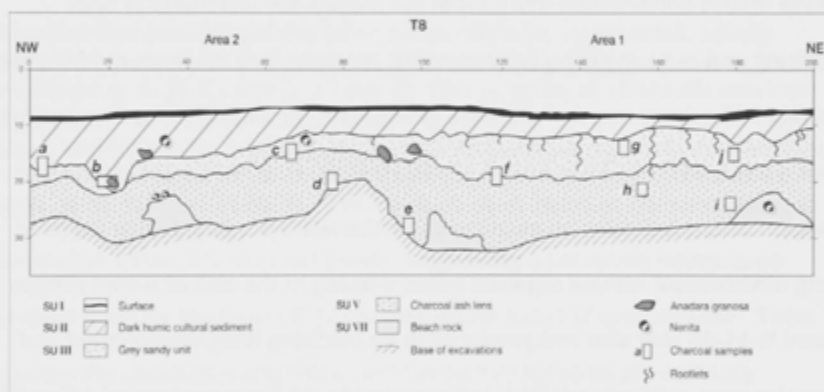


Figure 6. Stratigraphic profile of Trench 8, Malara, illustrating the complexity of the sediment profile in areas that were attributed to the processing of trepang (map produced by CartoGIS ANU).

The small sherds were considered to be too small for cutting to make the thin sections for petrographic analysis. Therefore a surface collection was made in two defined areas of the site with the objective to, (1) provide a sample of potsherds of larger size, and (2) give a better indication of the variation in the sherds discarded at Malara.

The earthenware sherds in the surface collection varied considerably in weight, thickness, and colour. A total of 88 sherds were recovered from surface collection areas A and B, with 49 sherds being suitable for thin section analysis. The majority of the 88 sherds were non-diagnostic sherd fragments, with only eight diagnostic sherds, comprising five rim sherds, two rim and neck sherds, and one sherd that featured portions of rim, neck and shoulder. Sherd size within this sample ranged from 67.8 g (B-10-37) to 0.5g (B-6-29 and B-3-10). Sherd wall thickness ranged from 3mm to 11.6 mm.

Sherd fabric colour was variable and the collection included a combination of sharp and diffused core margins following Orton et al's (2013:154) identification. These results demonstrate that pots at the Malara site were fired in both oxidising and reducing firing environments, meaning that the amount of oxygen contact in the firing was uncontrolled. Sherds B-5-19 and A-8-41 are examples from a reduced firing environment, cooled rapidly in air featuring a sharp core margin. Sherd A-5-19 is an example of earthenware produced in an oxidised firing environment without organics present owing to the lack of a core margin. Sherd B-11-43 was also produced in an oxidising firing environment and organics were originally present, but were lost in the firing process and thus this sherd features a diffuse core margin (Figure 7).

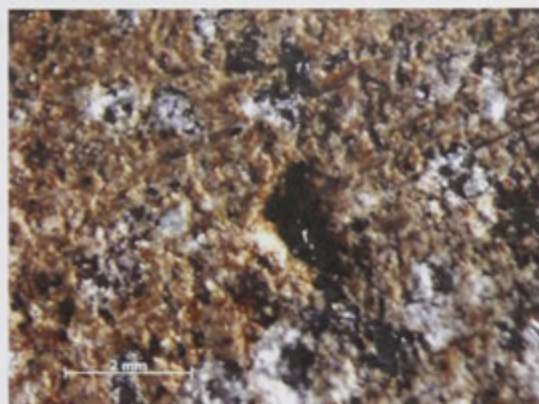


Figure 7. Sherd ABB-11-43: an example of an oxidised firing environment with organics originally present to produce a diffuse core margin.

Examination under a polarising microscope suggested that two temper categories and two distinct clay fabric types might be represented, initially designated as A, B, C<sub>1</sub> and C<sub>2</sub> (Table 4). Thin-sections of 18 sherds (ten from Area A and eight from Area B) were examined petrographically to establish the nature of the temper (Table 4). These sherds were selected after megascopic examination of the whole sherd assemblage using a polarising microscope identified them as representative samples of the range of earthenware. Table 4 indicates the sherd characteristics and the temper types as provisionally classified by megascopic examination using a hand lens.

Table 2. Results from microscopic examination of a sample of Anuru Bay earthenware sherds.

Type	Sherd-Temper Type Description	Area A Sample ID	Area B Sample ID	Microscopic Image
A	Thin ware with fine dark temper	ABA-1-1, ABA-8-4	None	N/A
B	Thin ware with fine pale temper	ABA-5-19, ABA-6-24, ABA-7-38	ABB-1-5, ABB-04-11, ABB-4-12	Figure 8
C1	Coarse ware with pale temper	ABA-2-3, ABA-3-6, ABA-7-33	ABB-11-43, ABB-11-44	Figure 9
C2	Coarse ware rim sherd with pale temper	ABA-4-14, ABA-4-16	ABB-1-4, ABB-5-21, ABB-5-23, ABB-10-37	Figure 10

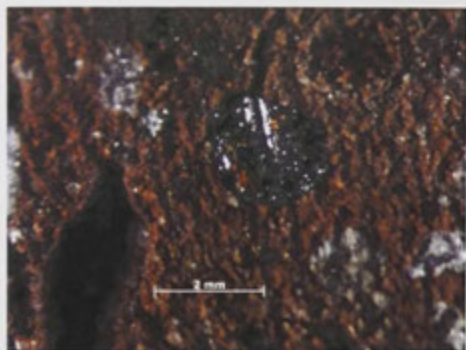


Figure 8. Sherd ABB-4-11: Category B thin ware with fine pale temper, an example of the fine clay fabric identified by Rowley (1998) as 'fine ware'.

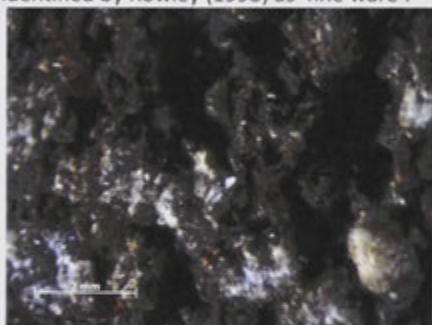


Figure 9. Sherd ABA-2-3: Category C1 coarse ware with pale temper and ferro-magnesium inclusion.

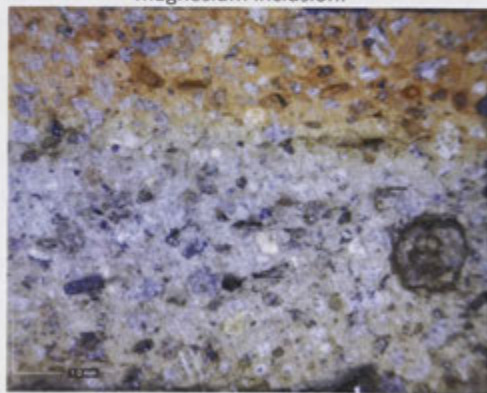


Figure 10. Sherd ABA-4-16: Category C2 coarse ware rim sherd with pale temper.

### ***Temper Types and Variation***

Petrographic analysis demonstrates that tempers on all sherds are moderately sorted, subrounded to subangular aggregates of andesitic volcanic sand, probably of fluvial origin. The only grain types in the temper are volcanic lithic fragments (polyminerallic grains internally variable texturally) and mineral grains of volcanic derivation, including plagioclase feldspar, pyriboles (pyroxene and amphibole) and an opaque iron oxide (probably magnetite). If either quartz (reflective of felsic volcanic origin) or olivine (reflective of basaltic volcanic origin) are present in the tempers, they must be quite rare, for neither were noted during thin-section analysis.

The only notable mineralogical variance occurs amongst the Type A sherds, in which biotite mica is present in trace amounts (noted macroscopically in both Type A sherds, and noted microscopically in Sherd ABA-8-4). The biotite mica forms only a minor component (presumably rare in Sherd ABA-1-1) of the ferromagnesian grain assemblage, which is dominantly clinopyroxene with subordinate hornblende and oxyhornblende. The two biotite-bearing tempers seem best regarded as outlier variants of a common temper spectrum in the Malara sherds. This interpretation is apparently confirmed by the presence of isolated flakes of biotite in the temper sands of at least four other Malara sherds from both collection areas (i.e. ABA-3-6, ABB-11-43, ABB-11-44, ABB-10-37).

The tempers of Type B, C<sub>1</sub> and C<sub>2</sub> sherds vary unsystematically in grain size, sorting and percentage of temper in relation to clay paste, but form a gradational spectrum that is probably related to exact source area and the habits of individual potters, but not to different locales of origin. Four Area B sherds (ABB-5-21, ABB-5-23, ABB-11-43, ABB-11-44) have tempers that are

somewhat better sorted and coarser grained than the others, but whether or not a slightly different assemblage of vessels were used at Area B as opposed to Area A is debatable. There are no systematic differences in the tempers of sherds from Areas A and B at the Malara site.

The compositions of the temper sands confirm that all of the Malara sherds are exotic to Australia, but neither confirm nor deny a potential origin from Sulawesi. Comparisons to other tempers studied in thin-section by Dickinson confirm, however, that the tempers in the Malara collection do not derive from Aru, Kei, Banda or Maluku Tengah (Buru, Gorom, the Lease Islands, Seram). The differences in ceramic typology and temper grain size demonstrated in Table 4 do not reflect any systematic generic variations in temper mineralogy that might signal different places of sherd origin. The most parsimonious interpretation of the temper compositions is that all examined sherds derive from the same general locale where generically related fluvial sands of variable texture could be collected to serve as temper in the same general ceramic assemblage.

### ***Summary of the Earthenware Analysis***

With so few diagnostic pieces found amongst the Malara sherds it was not possible to compare pot shape or decorative motifs with those of sherds from other Arnhem Land collections. The few decorative techniques observed are typical of South Sulawesi archaeological earthenware assemblages described by Bulbeck and Clune (2003) and unfortunately have been in long use and are therefore not reliable indicators for dating the Malara earthenware sherds. Also, the number of decorated sherds is far too small to offer a reasonable sample of the patterns to analyse. Dickinson did not have a comparative pottery collection from South Sulawesi to compare against the Malara sherds so was unable to

identify the sherds as definitely from this area. However, his analysis supports the conclusion that all sherds were from a single source area and in view of their compositional similarity to the Macassan sherds analysed by Rowley (1997) this is the likely point of origin for all the pots examined in Anuru Bay. Variability in the clay fabric could potentially be a result of manufacturing techniques, the technique of the individual potter or slight variation in collection locale for the clay, or a combination of these factors. The difference in clay fabric is largely textural, with Type A and B containing more silt, and Fabric Type C containing less silt and larger, gravel-sized inclusions therefore impacting on compaction and hardness. Fabric colour in the Malara surface collection is highly variable, suggesting unstable heating environments in a non-homogeneous manufacturing environment, typical of Indonesian earthenware pottery production (Bulbeck and Rowley 2001) and typical of Macassan earthenware. This conclusion is substantiated by both historical and ethnographic accounts of pottery production in the Indonesian Archipelago.

## **Discussion**

### ***Origins of the Anuru Bay Earthenware***

Macknight (1976) and Rowley (1997) proposed that the 'fine earthenware' may not be of Macassan origin. Key (1969) suggested that the 'fine earthenware' may originate from the Kei Islands, which were renowned historically in the 17<sup>th</sup> and 18<sup>th</sup> centuries as a major earthenware manufacturing locale in the eastern Indonesian archipelago. We can now be certain that, while calcareous tempers are found in some of the sherds at Tamarinda and from four other Kimberley assemblages indicating an origin point outside South Sulawesi, they are entirely absent from the Malara and Goulburn Island assemblages (Bulbeck and Rowley

2001:65). This indicates that the source of the earthenware pots on the Arnhem Land coast is likely to be exclusively South Sulawesi.

Bulbeck and Rowley (2001:67) discussed in detail the likely origins of earthenware procured by the crews of the trepang fleets, suggesting they sought superior earthenware from particular vendors through the port of Makassar. As Makassar was an established *entrepôt* linking eastern and western Indonesia from the early 17<sup>th</sup> century, quality earthenware from various origins should have been available in port at the time of the departure of the Macassan fleets (Bulbeck and Rowley 2001; Poelinggomang 1993; Sutherland 2000). During the 1700s, Chinese traders were importing earthenware obtained in Batavia to Makassar, and also exporting earthenware to other areas around the Flores Sea (Knaap 2006:491). Bulbeck and Clune (2003) noted that distinctive earthenware designs appear during the Islamic-Colonial period in southern Sulawesi. Very few earthenware pots with these distinctive designs, however, seem to have made their way to Australia via the Macassan trepang fleets, illustrating a choice by the crews to choose plain or less decorative wares for their voyages. It is likely that the crews of the trepang fleets could not afford such luxury ceramics and porcelains.

Another consideration in terms of the origin of the earthenware at Malara is to draw on historic analogies for the organisation of major maritime enterprises, such as whaling (Hunt 1842; Littlefield 1906; Schultz 1967). Whaling ships generally amassed the materials, tools and equipment necessary for their work at the time of departing their home port (Hunt 1842; Littlefield 1906; Schultz 1967), only stopping at other ports to seek provisions to supplement low stocks of perishables, such as occurred at Com in Timor (McWilliam 2007:1128).

Therefore it could be expected that trepang fishing fleets would be provisioned



with all non-perishables and equipment on leaving the port of Makassar, rather than acquiring earthenware en-route. Again, more utilitarian earthenware would be chosen because of the high likelihood of breakage, and low use-life expectancy during these maritime ventures.

### ***Implications for Malara Site Use***

Potsherd types indicated uniformity in the overall earthenware assemblage from Areas A and B which is consistent with previous analyses of southwest Sulawesi earthenware by Bulbeck and Rowley (2001) for the period of the 18<sup>th</sup> and 19<sup>th</sup> centuries. Based on the amount of earthenware recovered by Macknight (1969), the fact that potsherds are still eroding from the site, and considering Mitchell's (1994) analysis (Figure 4) of Macassan fleet numbers, it can be assumed that Malara must have been occupied intensively in the 18<sup>th</sup> century and began to fall out of use by the mid-19<sup>th</sup> century. It is also important from a social perspective that the fleets occupying, harvesting, and processing trepang at Anuru Bay originated from the port of Makassar. Although the earthenware does not identify any specific ethnic origin for crews, it is demonstrative as a proxy for a strong connection with Makassar and southern Sulawesi, and therefore it might be expected that the cultural beliefs of this region were pronounced in crew interaction with local Indigenous populations.

### **Conclusion**

While macroscopic analysis indicated the presence of two distinct tempers, this was not confirmed by the petrological analysis, which suggested Sulawesi as the likely, and sole, source of the pottery from Malara. The analysis ruled out the possibility of local manufacturing of pottery on the Arnhem Land coast. It also demonstrated that there is no presence of fine ware pottery from the Kei

Islands or other islands to the east of the volcanic belt. We would concur with Rowley that the differences noted between individual sherds are likely due to local variability within the source material used by the potters in South Sulawesi and not to different source islands. Given the reports by Bulbeck and Rowley (2001), differences between individual pottery techniques and manufacturing styles in Sulawesi have likely contributed to the small amount of variability observed in the Malara assemblage. The sample analysed from Anuru Bay supports the hypothesis that the earthenware used by the trepang fleet was all sourced at Makassar prior to the fleet's departure underlying the specific economic nature of the Macassan enterprise. It also strengthens the claim for Makassar and southern Sulawesi as the main origin point for trepang fleets operating in the Anuru Bay region.

Fieldwork was undertaken by Daryl Wesley and Sue O'Connor for the ARC-funded project "Baijini, Macassans, Balanda, and Bininj: Defining the Indigenous Past of Arnhem Land through Culture Contact" (LP0882985) with contributions from the Linkage Partners Bushfires Council NT and Commonwealth Department Sustainability, Environment Heritage and Water. The authors would like to thank Traditional Owners Ronald Lamilami and his family for their support, guidance and enthusiasm throughout fieldwork from 2008 to 2010. Dr Jack Fenner (Australian National University) provided the mapping of the Malara (Anuru Bay A site). We would like to acknowledge Dr Janelle Stevenson (ANU) for providing information regarding the geomorphic history of Anuru Bay. Also our Flinders University collaborators Dr Jennifer McKinnon, Jason Raupp, and students assisted with excavations and magnetometer field survey and advice on maritime fishing and whaling. Tony Barham (ANU) organised Masters of Archaeological Science ARCH8002 field participants. Grateful thanks for assistance from Australian National University student volunteers, as well as volunteers from the University of Queensland, Heritage Conservation Branch, Department of Natural Resources, Environment, Arts, and Sport and abroad. Thanks are also due to Katherine Seikel; Mirani Litster, and Melissa Hetherington (ANU) for laboratory supervision and ANU undergraduate student volunteers for sorting the excavated materials. The North Australia Research Unit (ANU) in Darwin supported the project with a base of operations for the fieldwork in the Northern Territory. The authors would like to thank Sally Brockwell (ANU) for providing comments on drafts of the paper.

## References

- Baker, R. 1984 Macassan Site Survey and Bibliography. Unpublished report prepared for the Museum and Art Galleries of the Northern Territory, Darwin.
- Berndt Museum Records 7152, 7249, 7246, and 7164
- Berndt, R.M. 1954 Pottery in Arnhem Land. *Man* 54:163–164.
- Berndt, R.M. and C.H. Berndt 1947 Discovery of pottery in north eastern Arnhem Land. *The Journal of the Royal Anthropological Institute of Great Britain and Ireland* 7(2):133–138.
- Berndt, R.M. and C.H. Berndt 1954 *Arnhem Land: Its History and its People*. Melbourne: FW Cheshire.
- Blair, S. and N. Hall 2013 Travelling the 'Malay Road': Recognising the heritage significance of the Macassan maritime trade route. In M. Clark and S. May (eds), *Macassan History and Heritage: Journeys, Encounters and Influences*, pp.205–226. Terra Australis 29. Canberra: ANU E Press.
- Bowdler, S. 2002 Hunters and traders in northern Australia. Forager-traders in South and Southeast Asia: Long-term histories. In K.D. Morrison and L.L. Junker (eds), *Forager-Traders in South and Southeast Asia: Long-Term Histories*, pp.167–184. Cambridge: Cambridge University Press.
- Bulbeck, F.D. and B. Rowley 2001 Macassans and their pots in northern Australia. In C. Fredericksen and I. Walters (eds), *Altered States: Material Culture Transformations in the Arafura Region*, pp.55–74. Darwin: Charles Darwin University Press.
- Bulbeck, F.D. and G. Clune 2003 Macassar historical decorated earthenwares: Preliminary chronology and Bajau connections. In J. Miksic (ed.), *Earthenware in Southeast Asia*, pp.890–102. Singapore: Singapore University Press.
- Clark, P. 2006 Monsoon traders lost on the northern Australian coast—historical evidence for their existence. Unpublished paper presented at the 18<sup>th</sup> Congress of the Indo-Pacific Prehistory Association, Manila, Philippines, 20–26 March.
- Clark, M.A. and S.K. May 2013 *Macassan History and Heritage: Journeys, Encounters and Influences*, Canberra, ANU Press.
- Clarke, A. 1994 *Winds of Change: An Archaeology of Contact in the Groote Eylandt Archipelago, Northern Australia*. Unpublished PhD thesis, School of Anthropology and Archaeology, The Faculties, The Australian National University, Canberra.
- Clarke, A. 2000 Time, tradition and transformations: The negotiation of cross-cultural engagements on Groote Eylandt, northern Australia. In R. Torrence and A. Clarke (eds), *The Archaeology of Difference: Negotiating Cross-Cultural Engagements in Oceania*, pp. 142–181. London: Routledge.
- Clarke, A. and U. Frederick 2011 Making a sea change: Rock art, archaeology and the enduring legacy of Frederick McCarthy's research on Groote Eylandt. In M.

- Thomas and M. Neale (eds), *Exploring the Legacy of the 1845-46 Arnhem Land Expedition*, pp.135–155. Canberra: ANU E Press.
- Crawford, I. 1969. Late prehistoric changes in Aboriginal cultures in Kimberley, Western Australia. Unpublished PhD thesis, Institute of Archaeology, London, University of London.
- Evans, N. 1992 Macassan loanwords in top end languages. *Australian Journal of Linguistics* 12(1):45-91.
- Ganter, R. 2003 China and the beginning of Australian history. *The Great Circle* 25(1):3–19.
- Ganter, R. 2006 Turning the map upside down. *History Compass* 4(1):26–35.
- Gibson, A. and A. Woods 1997 *Prehistoric Pottery for the Archaeologist* (2<sup>nd</sup> ed.). London: Leicester University Press.
- Grave, P. and I.J. McNiven 2013 Geochemical provenience of 16<sup>th</sup>–19<sup>th</sup> century CE Asian ceramics from Torres Strait, northeast Australia. *Journal of Archaeological Science* 40(12):4538–4551.
- Hall, R. 2009 Southeast Asia's changing palaeogeography. *Blumea* 54:148–161.
- Hunt, F. 1842 *Hunt's Merchants' Magazine and Commercial Review*. New York: Freeman Hunt.
- Junker, L.L. 2002 Economic specialisation and inter-ethnic trade between foragers and farmers in the prehispanic Philippines. In K.D. Morrison and L.L. Junker (eds), *Forager-Traders in South and Southeast Asia: Long-Term Histories*, pp.203–241. Cambridge: Cambridge University Press.
- Key, C. 1969 Archaeological pottery in Arnhem Land. *Archaeology in Oceania* 4:103–106.
- Knaap, G. 2006 All about money: Maritime trade in Makassar and west Java, around 1775. *Journal of the Economic and Social History of the Orient* 49(4):482–508.
- Knaap, G. and H. Sutherland 2004 *Monsoon Traders, Ships, Sippers and Commodities in Eighteenth-Century Makassar*. Leiden: KITLV Press.
- Lamilami, L. 1974 *Lamilami Spears: The Cry Went Up: A Story of the People of Goulburn Islands, North Australia*. Sydney: Ure Smith.
- Littlefield, L.A. 1906 Fitting out a whaler. *The Old Dartmouth Historical Sketches* 14:4–13.
- Macknight, C.C. 1969 The Macassans: A Study of the Early Trepan Industry along the Northern Territory Coast. Unpublished PhD thesis, School of Archaeology and Anthropology, The Faculties, The Australian National University, Canberra.
- Macknight, C.C. 1972 Macassans and Aborigines. *Oceania* 42(4):283–321.
- Macknight, C.C. 1973 The nature of early maritime trade: Some points of analogy from the eastern part of the Indonesian Archipelago. *World Archaeology* 5(2):198–208.

- Macknight, C.C. 1976 *The Voyage to Marege: Macassan Trepangers in Northern Australia*. Melbourne: Melbourne University Press.
- Macknight, C.C. 1986 Macassans and the Aboriginal past. *Archaeology in Oceania* 21:69–75.
- Macknight, C.C. 2008 Harvesting the memory: Open beaches in Makassar and Arnhem Land. In P. Veth, P. Sutton and M. Neale (eds), *Strangers on the Shore: Early Coastal Contacts in Australia*, pp.133–148. Canberra: National Museum of Australia.
- Macknight, C.C. 2013 Studying trepangers. In M. Clark and S. May (eds), *Macassan History and Heritage: Journeys, Encounters and Influences*, pp.19–40. Terra Australis 29. Canberra: ANU E Press.
- McCarthy, F.D. and F.M. Setzler 1960 *The Archaeology of Arnhem Land*. Sydney: Australian Museum.
- McIntosh, I.S. 2008 Pre-Macassans at Dholtji? Exploring one of northeast Arnhem Land's great conundrums. In P. Veth, P. Sutton and M. Neale (eds), *Strangers on the Shore: Early coastal Contacts in Australia*, pp.161–185. Canberra: National Museum of Australia.
- McWilliam, A. 2007 Harbours traditions in East Timor: Marginality in a lowland entrepôt. *Modern Asian Studies* 41(6):1113.
- Máñez, K.S. and S.C. Ferse 2010 The history of Makassan trepang fishing and trade. *PloS One* 5(6):e11346.  
<<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0011346>>
- May, S.K., P.S.C. Taçon, D. Wesley and M. Travers 2010 Painting history: Indigenous observations and depictions of the 'Other' in north western Arnhem Land, Australia. *Australian Archaeology* 71:57–65.
- Mitchell, S. 1994 Culture Contact and Indigenous Economies on the Coburg Peninsula, Northwestern Arnhem Land. Unpublished PhD thesis, Department of Anthropology, Northern Territory University, Darwin.
- Mitchell, S. 1996 Dugongs and dugouts, sharpsharks and shellbacks: Macassan contact and Aboriginal marine hunting on the Coburg Peninsula, northwestern Arnhem Land. *Bulletin of the Indo-Pacific Prehistory Association* 2(15):181–191.
- Morwood, M.J. and D.R. Hobbs 1997 The Asian connection: Preliminary report on Indonesian trepang sites on the Kimberley coast, NW Australia. *Archaeology in Oceania* 32:197–206.
- Mulvaney, D.J. 1996 Musing amidst the ruins. *Australasian Historical Society* 14:3–8
- Mulvaney D.J. and J. Kamminga 1999 *Prehistory of Australia*. Sydney: Allen and Unwin.
- Needham, R.S. 1984 *Alligator River, Northern Territory*. Geological Series E: *planatory Notes*. SD 1–1. Canberra: Bureau of Mineral Resources, Geology and Geophysics Australia.

- Northern Territory Times and Gazette 1885 The cruise of the 'Palmerston'. 7 March, p.3. Accessed 14 November 2013 at <<http://nla.gov.au/nla.news-article3157269>>.
- Orton, C., P. Tyers and A. Vince 2013 *Pottery in Archaeology* (10<sup>th</sup> ed.). Cambridge Manuals in Archaeology. New York: Cambridge University Press.
- Poelinggomang, E.L. 1993 The Dutch trade policy and its impact on Makassar's trade. *Review of Indonesian and Malaysian Affairs* 27:61–76.
- Powell, A. 1988 *Far Country: A Short History of the Northern Territory*. Carlton: Melbourne University Press.
- Rowley, B. 1997 The Makassar Connection: A Descriptive Analysis and Comparison of Macassan and Makassar Earthenwares. Unpublished BA (Hons) thesis, Centre for Archaeology, University of Western Australia, Crawley.
- Russell, D. 2004 Aboriginal-Makassan in the eighteenth and nineteenth centuries in northern Australia and contemporary sea rights claims. *Australian Aboriginal Studies* 2004(1):3–17.
- Schultz, C.R. 1967 Costs of constructing and outfitting the ship *Charles* □ □ Morgan, 1840–1841. *The Business History Review* 41(2):198–216.
- Searcy, A. 1909 *In Australian Tropics*. London: George Robertson.
- Senior, B.R. and P.G. Smart 1976 *Coolour Peninsula-Melville Island, Northern Territory*, □ □ □ □ Geological Series Explanatory Notes. Canberra: Bureau of Mineral Resources.
- Sinopoli, C.M. 1991 *Approaches to Archaeological Ceramics*. New York: Plenum Press.
- Sunter, G. 1937 *Adventures of a Trepong Fisher: A Record without Romance*. London: Hurst and Blackett.
- Sutherland, H. 2000 Trepong and wangkang: The China trade of eighteenth century Makassar ca 1720s–1840s. In R. Tol, K. van Dijk and G. Acciaoli (eds), *Authority and Enterprise among the Peoples of South Sulawesi*, pp.451–472. Leiden: KITLV Press.
- Sutherland, H. 2001 The Makassar Malays: Adaptation and identity, ca 1660–1790. *Journal of Southeast Asian Studies* 32(3):397–422.
- Sutherland, H. 2010 Treacherous translators and improvident paupers: Perception and practice in Dutch Makassar, eighteenth and nineteenth centuries. *Journal of the Economic and Social History of the Orient* 53(1–2):1–2.
- Sweet, I.P., A.T. Brakel, D.J. Rawlings, P.W. Haines, K.A. Plumb and A.S. Wygralak 1999 *Mount Marum, Northern Territory*, □ □ □ □ Geological Series Explanatory Notes. Canberra: Bureau of Mineral Resources.
- Taşon, P.S.C., S.K. May, S. Fallon, M. Travers, D. Wesley and R. Lamilami 2010 A minimum age for early depictions of southeast Asian praus in the rock art of Arnhem Land, Northern Territory. *Australian Archaeology* 71:1–10.

- Theden-Ringl, F., J.N. Fenner, D. Wesley and R. Lamilami 2011 Buried on foreign shores: Isotope analysis of the origin of human remains recovered from a Macassan site in Arnhem Land. *Australian Archaeology* 73:41–48.
- Thomson, D. 1949 *Economic Structure and the Ceremonial Exchange Cycle in Arnhem Land*. Melbourne: Macmillan.
- Trudgen, R. 2000 *My Ancestors Lie Down and Die*. Darwin: Aboriginal Resource and Development Services.
- Veth, P., M. Spriggs, S. O'Connor and A.D. Saleh 2005 Wangii Midden: A late prehistoric site, with remarks on ethnographic pottery making. In S. O'Connor, M. Spriggs and P. Veth (eds), *The Archaeology of the Aru Islands, Eastern Indonesia*, pp.5–12. Terra Australis 22. Canberra: ANU E Press.
- Warner, W.L. 1932 Malay influence on Aboriginal cultures of north eastern Arnhem Land. *Oceania* 2:476–495.
- Warner, W.L. 1937 *A Black Civilisation: A Social Study of an Australian Tribe*. New York: Harper and Brothers.
- Watson-Andaya, B.W. 2006 Oceans unbounded: Transversing Asia across 'Area Studies'. *The Journal of Asian Studies* 65(4):669–690.
- Wesley, D., J. McKinnon and J. Raupp 2012 Sails set in stone: A technological analysis of non-Indigenous watercraft rock art paintings in north western Arnhem Land. *Journal of Maritime Archaeology* 7(2):245–269.



**"Small, Individually Nondescript, and Easily Overlooked": The significance of contact beads from rockshelters in the Wellington Range, north western Arnhem Land.**

Authors: Daryl Wesley and Mirani Litster

Publication: Australian Archaeology

Current status: Accepted

Coordinated and conducted the excavation and survey of Wellington Range archaeological sites Djulirri, Malarrak 1 and 4, and Maliwawa (Bald Rock complex) for fieldwork during 2008 to 2010. Collated all excavation and survey data for further analysis. Undertook basic classification of the archaeological assemblages from these sites. With the other author composed the overall research question and continuing line of discussion. Developed the hybrid economy model framework to be applied in this paper. Undertook background research on ethnography and the archaeology of beads in Arnhem Land and Australia. Compiled site descriptions, excavation methods, radiocarbon dating analysis and context of the finds. Worked with the second author to classify the bead assemblage in the laboratory. Co-contributed to the development of the discussion and conclusion of this research paper.

Signed:  .....

Mr. Daryl Wesley

Worked with other author to develop the research question. Contributed background research on beads in Australian and world archaeological, ethnographic, and historical contexts. Developed appropriate methodology for bead classification system for the Wellington Range assemblage and undertook consultations with small finds and bead experts. Undertook cataloguing, classification, and provenance of the bead assemblage. Developed the discussion of the bead assemblage based on these results. Co-contributed to the development of the discussion and conclusion. Copy editing and preparation of the paper for publication.

Signed:  .....

Ms. Mirani Litster

## **“Small, individually nondescript, and easily overlooked”: Contact beads from north western Arnhem Land in an Indigenous-Macassan-European hybrid economy**

(Title courtesy of Peter Francis Jr 1989:19)

### **Abstract**

This paper examines the interactions between Indigenous Traditional Owners, Macassan trepangers, and European settlers in north western Arnhem Land. The recovery of an assemblage of beads from six Indigenous archaeological sites within the Manganowal estate (Djulirri, Malarrak 1, Malarrak 4, Bald Rock 1, Bald Rock 2 and Bald Rock 3) in the Wellington Range, supports the case for the introduction of glass beads to Arnhem Land in the pre-Mission era context. We present descriptions of one stone and 28 glass beads/bead fragments and examine the significance of the exchange of these items and how they became incorporated into existing Indigenous cultural systems. This archaeological evidence is assessed in concert with the historical, ethnographic, linguistic, and anthropological records. We interpret this within the framework of an hybrid economy model (Altman 2001, 2006, 2007) which establishes the presence of an operating hybrid economy between Indigenous people, Europeans and Macassans.

### **Introduction**

It is a convenient colonial discourse within archaeology to imply that Indigenous people were passive participants, who lacked the ability to negotiate with, and enforce rules about the nature of their engagements with others. This has sometimes been the case with studies into Macassan trepang fishing in northern Australian waters (Bednarik 2013:42-44). However, many historical examples exist to demonstrate the interaction was conducted on their own

terms and within their own normative traditions (c.f. Keen 2010). Such research illustrates that Indigenous people were far from passive economic participants, developing complex methods of interaction so as to allow the maintenance of customary systems. Anthropological studies of contemporary Indigenous communities in Arnhem Land have led to the development of an hybrid economy model of Indigenous engagement (Altman 2001, 2003, 2005, 2006, 2007, 2009). Altman puts forward a strong case for the model as a method for assessing the interaction between Indigenous communities and non-customary economies from state and market based sectors. This therefore provides a compelling basis through which to explore interpretations of Indigenous interactions with Macassan fishermen, and later European settlers during past culture contact periods in Arnhem Land.

Australian archaeology in recent decades has refocussed the objectives of assessing the nature of culture contact between Indigenous and settler societies to avoid ethnocentricity, unidirectional models and colonial bias (c.f. McNiven and Russell 2002; Paterson 2010, 2011; Silliman 2001). Currently, the contact period between Indigenous people, Europeans and South East Asian people in the Northern Territory is considered to occur post AD 1720 with more recent studies suggesting a longer timeframe extending into the 17<sup>th</sup> Century (Clarke 1994; Macknight 1969; Mitchell 1994; Taçon et al. 2010; Theden-Ringl et al. 2011). Previous explorations into the extent and nature of culture contact between Aboriginal people and Macassans in northern Australia have included studies of economic resources (Clarke 1994; Mitchell 1994), skeletal material (Macknight and Thorne 1968; Theden-Ringl et al. 2011), ceramics (Grave and McNiven 2013) and rock art (May et al. 2010; Taçon et al. 2010; Wesley et al. 2012). To further investigate this issue, research was carried out by one of the

authors (DW) at Anuru Bay (a major trepang processing site) and nearby rockshelter sites in the Wellington Range (Figure 1).

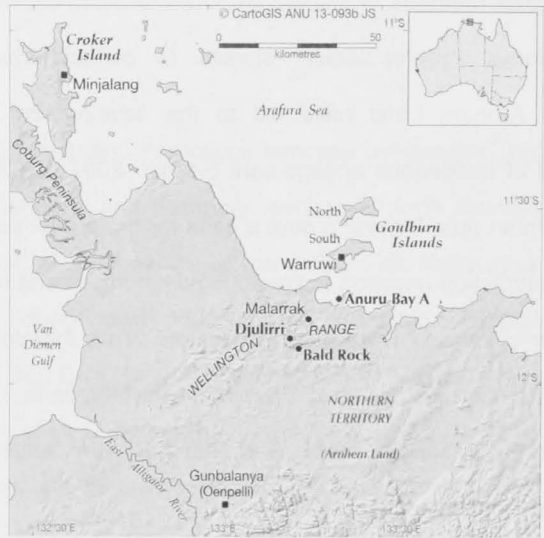


Figure 1. Anuru Bay and other archaeological sites in the Wellington Range, Arnhem Land, discussed in this paper.

Watson-Andaya (2006:675) noted that one of the most effective means of tracking cultural interactions in history is through a consideration of trade and material culture. Macknight (2013:27) remains sceptical that archaeology will be able to answer such questions regarding interaction between Macassan trepangers and Aboriginal people. Contra to Macknight's (2013:26–28) position regarding the difficulty of using archaeological as a means to elaborate on Indigenous-Macassan interaction, the recovery of 'contact beads' (defined here as those introduced to Indigenous people by settlers or traders) from the Wellington Range archaeological sites provides supporting evidence of Macassan-Indigenous-European interactions. Beads are suggested to have comprised just one material culture item in a wider inventory of Macassan-Indigenous-European exchanges in the historical literature (Barrkmann 2010;

Blair and Hall 2013:210; Clark and May 2013; MacKnight 1976; Mitchell 1994:98–100; Paterson 2010:168; Powell 1982:35–36); however, to date they have received little attention. In fact, Russell states that 'In the absence of unambiguous trade goods (such as glass beads) we are greatly hampered in studying the impact of contact on Australian Aboriginal culture' (2005:45). Therefore, this study presents a preliminary analysis of the Wellington Range beads, drawing on Altman's (2001, 2003, 2005, 2006, 2007, 2009) Indigenous hybrid economy model to explore their implications for our understandings of culture-contact in northern Australia.

#### **Understanding Exchange: A Hybrid Economy Model for Western Arnhem Land**

Various models for examining activity in archaeological contexts have been drawn from anthropological models i.e. human ecology (see Butzer 1982; Jochim 1981, 1982; Steward 1938, 2006; Thomas 1973, 1989). Here we introduce an economic model based on contemporary studies of Indigenous economy and society by Altman (2001, 2003, 2005, 2006, 2007, 2009). Altman's research into contemporary Indigenous economies in northern Australia developed a hybrid economy model as an 'analytical construct for the assessment of the particularities of any one situation and the linkages between the market, the state and the customary components of the economy' (2006:36). This model has also been used to provide a robust explanatory framework for Indigenous culture contact behaviour represented in the historical record (c.f. Keen 2010). It emphasises Indigenous customary economic activity and how this inputs into market economic activity. It further highlights the significant contribution made by Indigenous people, which often remains

unquantified and unrecognised in assessments of mainstream economies in northern Australia (Curchin 2013:16-18).

Altman's (2001, 2006, 2007) framework is based on a three sector approach consisting of customary, market and state sectors emphasising the individuality of Indigenous responses in any given case study. Altman (2006:36) explicitly states that the linkages and interdependencies that arise between the groups involved in culture contact are complicated and influenced by these market, political, and social forces. Therefore the social, behavioural, and economic outcomes for Indigenous communities in Arnhem Land were greatly influenced by their own customary practices in these interactions. Although the model is based on contemporary observations, we argue it is equally applicable to the pre- and post-colonial periods (c.f. Keen 2010), when customary Indigenous communities interacted with various market (Macassan and European) and state (European) sectors.

The operating mechanisms of each sector from the hybrid economy model as applied to the western Arnhem Land culture contact situation are further explained here. Customary Indigenous society is governed by a complex set of beliefs that determine land tenure, kinship, and spiritual affiliation. Macassan interests in northern Australia were related to the seasonal exploitation of offshore natural resources, with the need for access to localised onshore areas for processing and limited re-provisioning—it is even possible they considered Australia a part of their sphere of influence and therefore that they were entitled to exploit local resources (Macknight 1969; McIntosh 2008). European influences comprised a mixture of state and economic factors, with the imposition of colonial governance and introduction of settler economies. In

addition to each sector being governed by different economic modes, they also displayed very different social, religious, property ownership, and governance conventions. These beliefs, rules, and desires obviously had a direct impact on how contact proceeded and developed, resulting in a complicated set of circumstances influenced by market, political, and social forces that did not result in simple one-way interaction (Altman 2006:36). These interactions correspond to a set of complex phases of contact history, being characterized by several discrete, but overlapping, periods, each with distinctive material culture and potential economic influences.

The social, behavioural, and economic outcomes for Indigenous communities in Arnhem Land during the contact period should result in archaeologically reflected economic and behavioural changes. Indeed, this has previously been demonstrated to be the case on the Cobourg Peninsula (Mitchell 1994, 1996) and Groote Eylandt (Clarke 1994) (see also Berndt and Berndt 1954; McIntosh 1996a, 1996b, 2006, 2008; Thomson 1949; Warner 1932, 1937). Although the issue of sustained Macassan contact with the same groups of Aboriginal people on an annual basis has not been effectively demonstrated, researched or explained (Peterson 2003). The Wellington Range provides a significant research area to explore these questions, owing to the close proximity to the known trepang processing site at Anuru Bay. Additionally, the Manganowal Traditional Owners can demonstrate a meaningful connection to Macassan and later European groups in the area (Lamilami 1974). In the late 19th Century, Lamilami's (1974) Uncle went to Sulawesi (or Manggadjarra as it is known in Mawng). Lamilami (1974) also lists Macassan words that are used in the Mawng language and a number of other accounts that relate to the Macassans regarding reciprocity, celebration, and interaction between Macassans and

Manganowal people (Lamilami 1974). Lamilami's sister, Mondalmi, told of how their father had worked for the Macassans collecting trepang (Berndt 1986). Therefore the traditional country of the Manganowal clan provides an excellent region to chart such responses through material culture changes evident in the archaeological sites of the Wellington Range.

### **Macassan Trepangers in Marege': Interaction between Sulawesi and Australia**

The nature of the trepang industry in Sulawesi and the exploitation of northern Australian (Marege') stocks of the resource have been discussed in great detail in the literature. Figure 2 illustrates the main centres of trade from island South East Asia involved in this industry (Berndt and Berndt 1954; Bowdler 2002; Bulbeck and Rowley 2001; Clarke 1994, 2000; Ganter 2003, 2006; Macknight 1969, 1972, 1973, 1976, 1986, 2008; Máñez and Ferse 2010; Mitchell 1994, 1996; Rowley 1997; Russell 2004; Sutherland 2000; Trudgen 2000; Warner 1932, 1937). However, the *timing* of the first Macassan visits to Australia remains a continuing source of debate (see Macknight 1976, 2013; May et al. 2010; Taçon et al. 2010; Theden-Ringl et al. 2011), though it is clear that these visits occurred more frequently from the late 1700s to satisfy the increasing demands from Chinese markets (Macknight 2013). Alongside the extraction of trepang, other opportunistic exchanges occurred, involving the transfer of Indonesian products such as cloth, tamarind fruit, dugout canoes, iron, glass, beads, ceramics, rice and drugs (including alcohol, betel nut, opium and tobacco) and Australian products including ironwood, cypress pine, sandalwood, pearls and pearl shell, buffalo horns, and hawksbill turtle shell (Barrkmann 2010; Blair and Hall 2013:210; Clark and May 2013; Dreyfuss and



Dhulumburk 1980:14–15; MacKnight 1976; Mitchell 1994:98–100; Paterson 2010:168; Powell 1982:35–36).

Beads made from a variety of materials and from many sources were available in Sulawesi during this period; however, of particular relevance to this research was the presence of European glass beads in the area. During the 17<sup>th</sup> and 18<sup>th</sup> centuries European glass beads slowly filtered into the islands; however, those recovered in the area tend to be of 19<sup>th</sup> century types (Francis 2002:171). The influx of European beads in the region accelerated in the 20<sup>th</sup> century, with a total of 69% of beads traded from Singapore being of a European origin by 1922. The influx of Czech products contributed to this proliferation, and there was also an increase in Japanese beads in the area (Francis 1996:4, 2002:171). Though not locally considered prestige items in Sulawesi (David Bulbeck pers. comm. October 2013), glass beads were incorporated into local material culture, particularly head-dresses consisting largely of drawn glass beads worn ceremonially by women (Departmen Pendidikan dan Kebudayaan 1997:124, 165, 221). Other beaded materials of relevance include necklaces and belts, items that were present throughout South-East Asia (Departmen Pendidikan Nasional, Bagian Proyek Pembinaan Permuseuman Irian Jaya 2000:12; Departemen Pendidikan Dan Kebudayaan 1997:16).



Figure 2. Island South East Asia illustrating Macassan links to Australia, discussed in this paper (after Blair and Hall 2013:212; Morwood and Hobbs 1997:198; Russell 2004:8; Sutherland 2000).

While beads are often included in the lists of commodities that Macassans brought to Arnhem Land (e.g. Altman 1979; Berndt 1951; Berndt and Berndt 1954; Breen 2008; Clark and May 2013; Dewar 1995; Macknight 1972; Mitchell 1994, 1996; McCarthy and Setzler 1960; McQueen 2010), the original sources for these claims appear to be Indigenous oral traditions cited by a handful of early ethnographers, most notably Thomson (1949), Warner (1932), and Berndt and Berndt (1954). The first explicit linking of beads with Macassans in the ethnographic literature was by Thomson, who visited Arnhem Land from 1932. He indicated that beads, belts and string were initially introduced to eastern Arnhem Land by Macassans (Thomson 1949:86). Mitchell (1994:115) conducted a thorough review of the relevant 19<sup>th</sup> century historical literature for trade commodities in northern Australia and could not find any direct European observation of a trade in beads. However, the use of beads by Macassans to

gain access to marine territories and for labour exchange is not historically documented. Indeed, the lack of historical evidence for any such labour exchange arrangements was clearly demonstrated in the Croker Island Native Title claim (Peterson 2003).

Examining the linguistic evidence provides further clues to the nature of the Macassan trade in beads. The presence of the Makassarese words for bead, 'manik-manik' and jewellery, 'manimani', as loan words in Arnhem Land Aboriginal languages in the form of 'mani mani' (bead) and, 'ammanimani' (necklace), suggests a potential Macassan introduction or exchange (Evans 1992:76). This linguistic evidence is probably the strongest indicator that glass beads or beaded necklaces and chokers have been brought to Australia from Sulawesi as part of the goods for trade with Indigenous groups in Arnhem Land.

### **Indigenous Use of Beads in Australia: Continuing Traditions and Material Transitions**

It is important to emphasise that the use of introduced contact beads did not occur in a material culture vacuum in Australia as the use of such items for personal adornment has a Pleistocene antiquity (Balme and Morse 2006; Habgood and Franklin 2008, 2011; Hiscock 2008; Feary 1996; McAdam 2009; Morse 1993; Pretty 1977). Whilst more direct dating of organic beads will eventuate in a more refined understanding of early bead use in Australia, the earliest evidence comes from the Mandu Mandu Creek rockshelter in the Cape Range peninsula, Western Australia where *Conus* sp. beads were found in layers dated to > 32,000 years BP (Morse 1993). Ten tusk shell beads have also been found at Riwi in the Kimberley (of the families Dentaliidae, Fustiariidae and Laevidentaliidae), Western Australia and are associated with deposits dated to approximately 30,000 years BP (Balme and Morse 2006).

These beads were distributed inland for hundreds of kilometres, strengthening the argument that these were significant items (Balme and Morse 2006). Late Pleistocene evidence for beads has also been established from Devil's Lair with three macropod bone beads recovered from layers dated from between 12,000 – 19,000 years BP (Dortch 1979:39; 1980). Bead use continued during the Holocene, with evidence emerging from a number of sites (Habgood and Franklin 2008; Pate 2006). The presence of beaded objects has been suggested in Australian rock art studies, although not dated. McAdam (2009:97-102) discussed the likelihood of beaded objects being depicted in Australian rock art and cites a number of examples from the Kimberley, Western Australia to Arnhem Land, Northern Territory. Arnhem Land has a great deal of material culture depicted with anthropomorphic figures. Chaloupka (1993:233) has also documented stencils of objects in Arnhem Land rock art that he posits are likely to be necklace or choker type objects.

The ethnographic record also reveals information concerning more recent usage of organic beads. McAdam (2009:227,353) reported from the examination of 1007 historical objects from museum collections that organic beads were made from shell, bone, grass, reeds, and teeth to produce an extraordinary variety of material culture items in the 19<sup>th</sup> and 20<sup>th</sup> centuries. She (2009:382) also concluded that beaded items were multi-functional, dependent of kinship, gender, and age, and were part of a complex customary value and status system. Contemporary Indigenous production of beads continues to utilise the same resources as documented by McAdam (Simak 2007). Simak (2007:5) provides a long list of contemporary source materials for use as beads including a high diversity of different species of shells, grasses, reeds, plant seeds, nuts, dried fruit, and vertebrae. Simak (2007) reveals that objects (i.e.

necklaces) made from these beads are afforded a very high level of traditional significance across many different Indigenous groups in Australia. Therefore beaded items have had profound traditional significance in Aboriginal culture from the Pleistocene to the present.

Early European interactions were noted to involve the exchange of beaded items, which likely became incorporated into the aforementioned material culture framework. One such prominent example included James Cook, who left beads, ribbons and cloth in exchange for taking 40 or 50 spears from an abandoned hut (Pearson 2005:61). Birmingham (1976:314–315) reported finding a number of glass beads at the Aboriginal Wybalenna mission. Another Indigenous mission context where beads were found was at the Ooldea Soak and Mission site in South Australia (Brockwell et al. 1989). Brockwell et al. (1989:68) reported surface finds of small glass beads within the former mission precinct. A cache of blue glass beads was reported to be eroding from the chest area in a burial context from the Snaggy Bend burials on the central Murray River (Clark and Hope 1985:71). Megaw (1993:9) reports the find of a single blue glass bead from the uppermost levels of the main Curracurrang rockshelter in Sydney's Royal National Park. Megaw speculated questionably that this glass bead may have been given to Aboriginal people south of Sydney by the English explorers Bass and Flinders in 1796 (Anon 1963:6). Otherwise, according to Hardy (1998:40), there was a distinct lack of traceable artefact types for the majority of Aboriginal people from the contact period since 1788 in the Sydney region. Hardy's (1998:40–41) study of culture contact with Aboriginal people in the Sydney region found that there were no continuous 'cultural markers' such as beads. Birmingham (1976:314–315) thus far is the only source that has linked introduced glass beads to a pre-existing customary context, relating their use to the

traditional threading of shell beads. With the exception of the larger finds at Wybalenna, Snaggy Bend, and Ooldea Soak Mission there has been a notably low reporting of glass beads from post-contact Indigenous archaeological contexts, which could in part be due to their being recorded broadly as 'small finds', or their not being captured in sieve residues as a consequence of their size.

### ***Contact Beads in the Northern Territory and Arnhem Land: History, Ethnography and Archaeology***

The earliest historical reference to contact beads in the Northern Territory that we have been able to locate dates from 1705, when the Dutch vessels *Vossenbosch*, *Nova Hollandia* and *Wajer* explored the Tiwi Islands, reporting that the locals 'appeared to be very greedy after linen, knives, beads, and such knick-knacks' (Forrest 1995:16). However, the majority of evidence for beads in western Arnhem Land derives from late 19<sup>th</sup> and early 20<sup>th</sup> century ethnographic sources and collections. Baldwin Spencer's forays into Arnhem Land in 1912 resulted in many relevant photographs, including one of an Iwaidja man (from the Coburg Peninsula) wearing a beaded necklace with diamond designs (Welch 2008:7), while others illustrate men wearing multi-strand bead necklaces (Welch 2008:xiv). Similarly, Paul Foelsche (Sub-Inspector of Police) photographed the Indigenous people of Darwin, the Tiwi Islands, and western Arnhem Land extensively during the 1880s, with many of his pictures also showing people wearing beaded items (Wells 2003:16). However, Spencer considered that the use of European materials in Indigenous production 'spoil[ed] ... originally simple but beautiful native work' (Welch 2008:186). Consequently, as noted by Simak (2007), such items may have been

deliberately ignored, or at the least been considered un-noteworthy, by early anthropologists and ethnographers.

There are scant references to the local use of glass beads as a trade item by Europeans. While in 1878 a local newspaper reported that local merchants Mander and Barlow could import and supply beads in Palmerston (later Darwin; *Northern Territory News and Gazette* 1878:1), we could find no further newspaper references to the sale or supply of beads. Yet there are many records demonstrating that Aboriginal people were being paid for their labour in flour, tea, sugar, cloth, tobacco, knives, tomahawks, fishing lines and blankets (Dewar 1995:13; McKenzie 1976:10; Webb 1938:61).

Hamby (2011:513) documented museum collection items that used introduced materials, such as coloured wool, buttons, beads, and cloth. She (2011) found that these introduced materials were sometimes incorporated into traditional 'biting bags'. This was illustrated by an example of a western Arnhem Land biting bag with beads collected in 1918 from Gunbalanya (Oenpelli) (Hamby 2011:513). Further evidence of the use of beads in the early 20<sup>th</sup> Century in Indigenous material culture from the Tiwi Islands and western Arnhem Land region includes beaded objects (necklaces, headbands and chokers) in the British Museum, donated by Jessie Litchfield between 1925 and 1930 (Figure 3).



Figure 3. Example of the glass beaded headband and necklace collection from Northern Territory sourced between 1925 and 1930 by Mrs Jessie Litchfield and now held at the British Museum (AN1163861001).

### ***Contact Beads in Arnhem Land Archaeology***

Allen (1969, 2008) suggested from his archaeological investigations at Port Essington, that the typical contact items in Arnhem Land Indigenous sites should include metal, tobacco and matchbox tins, metal fragments, lead shot, bullets, bullet casings, clay pipes, buttons, glass, and some ceramics. But, despite numerous excavations, there has been little reporting or discussion of contact period artefact assemblages from stratified deposits (Table 1 and Figure 4).





Figure 4. Historical places referred to in the text, and archaeological sites with glass beads (Clarke 1994; Macknight 1969; Mitchell 1994; Schrire 1984).

Table 1 Bead data from archaeological sites in Arnhem Land.

Site	Number of Beads	Depth below Surface (cm)	Laboratory	Uncalibrated Date BP	Sample Depth below surface (cm)	Source
Jimeri I	3	0-5	GAK-630	230	0-5	Schrire 1982:152
Jimeri II	30	0-10	N/A	N/A		Schrire 1982:196
Irgul Point Site 25	Unknown number of clay beads	Surface	N/A	N/A		Mitchell 1994:213
Makbumanja	1 x red glass	0-2	ANU-8321	710±60 Atactodea striata	13	Clarke 1994:174-175
Marnkala Cave	1 x red glass	0-12	ANU-8316	350±60 charcoal	12	Clarke 1994:293-295
Aburkbumanja	1 x red glass	4-8	ANU-8328	420±60 Tapes hiantina	17	Clarke 1994:404-405

Schrire (1982) excavated five sites in the western Arnhem Land plateau region and recovered glass, iron fragments, beads, cloth, and some miscellaneous contact items from three, with beads only found in the sites in the southern gorges of the Arnhem Land plateau rather than in sites more exposed to areas of European contact (i.e. Oenpelli mission and buffalo shooting on the northern floodplains). She recovered three glass beads from the top 5 cm of Jimeri I (from a 13 m<sup>2</sup> excavated area) and 30 glass beads from the top 10 cm of Jimeri

II (from a 22 m<sup>2</sup> excavated area) (Schrire 1982:152, 196–197). Analysing contact artefact assemblages were outside of the scope of the archaeological interpretations presented by Schrire (1982) and therefore she only reports the presence of the beads in the Jimeri assemblage. Mitchell (1994: 176, 213) reported sherds of Macassan earthenware, fragments of European and Asian porcelain, tobacco pipe fragments, metal fragments, iron nails, flaked glass, and glass fragments from middens on the Coburg Peninsula and surrounding islands, and noted 'clay' beads amongst the contact artefacts recorded at the Irgul Point shell midden. He did not provide an attribution to the origin of these clay beads (Mitchell 1994:213). On Groote Eylandt and Bickerton Island Clarke (1994:134) found low densities of earthenware pottery sherds, blue pattern glazed ware, white ceramics, glass fragments, iron fragments, two pieces of bronze and three glass beads. On Groote Eylandt, single beads were recovered from both Makbumanja (an open shell midden) and Marngkala Cave (rockshelter) (Clarke 1994:134, 296). A single bead was also recovered from Aburrkbumanja (a midden complex) on Bickerton Island (Clarke 2000:156). All three beads were red glass, with a similar oblong shape, reflecting a low diversity and abundance of beads represented in this area. Clarke (2000:156–157) interpreted all three sites as being occupied in the Macassan period (>1700 to 1907 AD), with use of Marngkala Cave and Aburrkbumanja continuing into the Mission period (post-1920 AD). Macknight (1969:315) recovered three green, one yellow, and one blue glass bead from the Anuru Bay site and another white bead from a trepang processing site on Hardy Island, though he did not speculate on the bead's age or function from either site.

While excavations at the Anbangbang rockshelter produced some glass and metal fragments from the surface levels, no beads were reported to have been recovered from this site (Jones 1985), nor from Djuwarr 1, Nauwalabila 1 or open sites along the South Alligator River (Jones 1985). Allen and Barton (1989) reported no glass beads or recent contact artefacts from excavations at Narradj Warde Djobkeng. Other post-contact sites investigated by Mitchell (1994) in association with the establishment of Fort Wellington and Victoria settlement at Port Essington c. 1820—1840 included the Minto Head shell midden. Both Allen (1969) and Mitchell (1994) assessed this site as being occupied in two phases: initially at the time of Port Essington (1840s) and then later in the 1890s. Artefacts recovered here included flaked glass, pottery sherds, tobacco pipe fragments and several iron objects; however, no beads were recovered (Mitchell 1994:204). Collectively, this evidence suggests, albeit via an absence of evidence, that beads were not part of the European and Indigenous trade economy in the early 19<sup>th</sup> century.

## **Beads from the Wellington Range: Methodology, Results and Interpretation**

### ***Archaeology of the Wellington Range Bead Assemblage***

The study area is located in northwestern coastal Arnhem Land, where an outlier of the Mamadawerre Formation forms the Wellington Ranges, incorporating the offshore Goulburn Islands, with King River forming the area's major drainage system to the east (Figure 1). Owing to its proximity to the major trepang processing site at Anuru Bay (see Macknight 1969, 1976) and the abundant rockshelter sites found in the nearby sandstone range (Chaloupka 1993), current research has focused on the central Wellington Range within the Manganowal Traditional Owners estate (Figure 1).

Malarrak 1, Malarrak 4, Djulirri (also known as *Djurrirri*), Bald Rock 1, Bald Rock 2 and Bald Rock 3 (also known as *Maliwawa*) are located at varying distances (12–20 km) from the major Anuru Bay trepang processing site on the coast and are approximately 140 km from the Port Essington (Victoria Settlement) outpost. Malarrak 1, Malarrak 4 and Djulirri are sandstone overhangs on upper rocky scree slopes with substantial cultural deposits; they also contain a large corpus of rock art with Macassan imagery. Bald Rock 1, Bald Rock 2 and Bald Rock 3 are shelters at the base of outlier sandstone outcrops on the sandy plains, with deep cultural sediments. The Malarrak sites are the northernmost rockshelters along the Wellington Range, Djulirri is located in its central western portion, and the Bald Rock sites are found on the southern margin of the range.

Excavation methods utilised excavation, recording, and sampling techniques as originally developed by Johnson (1979), and later refined by Burke and Smith (2004:115-162), and Balme and Patterson (2006:104-106). Excavation forms used were those from Burke and Smith (2004:351-352). The purpose of excavating was to establish a general occupation sequence for the region with specific reference to establishing the post-contact material culture sequence. Excavation was conducted in 1 m<sup>2</sup> units and depth was controlled through excavating at 2 cm depth for each spit. Each excavated square involved sediment descriptions, Munsell chart colour identification of sediments, pH testing, end unit sketches and photographs followed by stratigraphic drawing of pit walls. During the excavation any exposed *in-situ* artefacts and charcoal samples for radiometric dating were individually recorded with X,Y,Z measurements (cm) and bagged separately. Sediments were then screened through 6 mm and 3 mm sieves for further sorting in a laboratory setting.

A total of 30 beads/bead fragments were recovered from excavated contexts and the surfaces of the aforementioned sites. Of these, 12 were from a 6 m<sup>2</sup> surface collection at Djulirri, four were from a 10 m<sup>2</sup> surface collection at Malarrak 4, and the remaining 14 were recovered from 1 m<sup>2</sup> test excavations at four of the sites (Table 2). Another bead was also recovered within Stratigraphic Unit 1 (SU 1) from Malarrak 1 (SQ25 XU6); however, it was misplaced during transportation and thus is not included in this analysis beyond Table 3 where it has been included to assist in establishing the chronology of the Wellington Range bead assemblage. Excavated beads were found either on the surface or in the uppermost 15 cm (i.e. Stratigraphic Unit 1) of every site, and were all associated with other contact materials, such as glass and iron fragments, flaked glass artefacts, iron spear barbs, and small quantities of porcelain, stoneware, and earthenware sherds. No beads were found as outliers on their own in deeper units containing no other contact artefacts. In all sites, SU 1 was uniformly dark greyish brown, organic and charcoal rich, and comprised very fine-grained, well sorted silt and sand grains. Figure 5 is the south wall section drawing of SQG25 from Malarrak 1. It illustrates the context of SU 1 that is replicated in every excavated deposit.

Table 2 Summary of stratigraphic information for beads from the Wellington Range archaeological sites.

Site	Bead ID	Square	Excavation Unit	Depth Below Surface (cm)
Djurrirri	1-12	1,2,3,4	Surface	Surface
Malarrak 4	13	11	2	1-2
	14	11	3	2-4
	15	11	4	4-6
	16	11	4	4-6
	17	11	6	11-15
Bald Rock 1	18	A1	3	3-4
	19	A1	3	3-4

	20	A1	6	6-7
Bald Rock 3	21	1	2	0-4
	22	1	3	4-7
	23	1	4	7-9
	24	1	4	9-11
Malarrak 4	25-28	5, 10, 11, 12	Surface	Surface
Bald Rock 2	29	1	2	12.5
Malarrak 1	30	G25	6	11.5-15

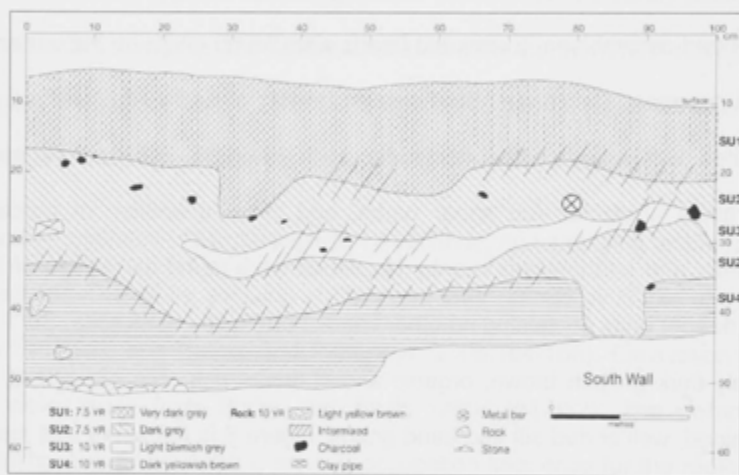


Figure 5. South wall section drawing of square G25 at Malarrak 1.

Charcoal samples from within SU 1 were submitted for dating from Malarrak 1, Malarrak 4 and Bald Rock 1 to establish a chronology (Table 3). Beads were recovered from excavation units above, within, and below some of the dated units (Table 3). Dates were calibrated using OxCal 4.2.2. As shown, an outlier date from Malarrak 1 SQ25 XU6/3 sample returned a calibrated date of 1436–1490 cal AD, whereas generally the other dates calibrated within the 18<sup>th</sup> and 19<sup>th</sup> centuries, with the most recent age determination being 1921 cal AD (Table 3). Figure 6 shows the calibrated distributions, illustrating the difficulties that occur in dating post-1700 AD samples (see Theden-Ringl et al. 2011). A range

of taphonomic and post-depositional factors such as animal and insect (termite) burrowing, vertical and horizontal impacts from climate, and anthropogenic influences are reported to occur in Northern Territory archaeological sites that can have various impacts on cultural materials and sediments (c.f. Bourke 2000; Brockwell 2009; Gregory 1998; Guse 2006; Mowat 1994, 1995). Any of these post-depositional mechanisms may account for the transport of small particles of sediment and charcoal, and even possibly artefacts up or down through cultural deposits (Clarkson 2007). Therefore, larger pieces of *in-situ* charcoal were selected for submission for AMS dating. Despite this precaution, there may have been vertical movement that has influenced the return of the older date obtained from sample NZA32470.

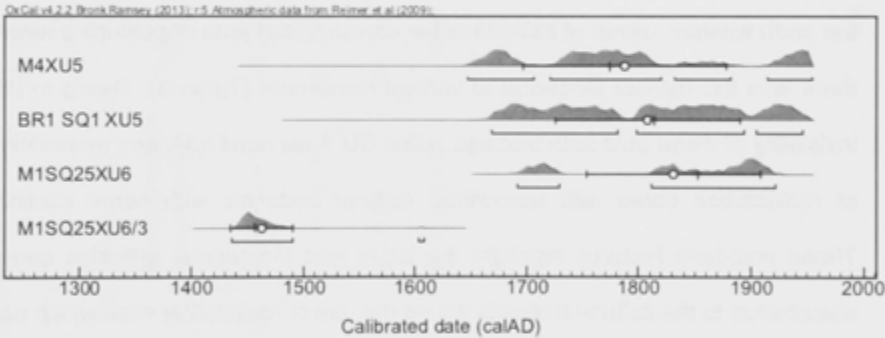


Figure 6. Calibration curve distributions for Malarrak 1, Malarrak 4, and Bald Rock 1 dates; the circles indicate the mean ages.

Nevertheless, out of all rockshelters excavated, Malarrak 1 proved to have the greatest post-depositional issues regarding the integrity of the deposit. It became apparent at Malarrak 1 by XU12 that there were at least 5 post-hole features in the north-west quadrant of SQG25. The post-hole features were

indistinguishable in the very dark grey to dark grey charcoal rich sediments of SU 1 and SU 2 until the excavation reached the light brownish yellow sediments of SU 4 (See Figure 5). There is strong ethnographic evidence that the post-holes are the result of construction of burial platforms in the site during the final phase of site use during the post-contact period as recorded by Poinant (NLA 5396-298; 5396-299, 5396-300) in a site visit during 1952. This particular post depositional disturbance context is unique to Malarrak 1. All beads were recovered later in the laboratory sorting phase from the 3 mm sieve residue. As the bead from Malarrak 1 was not recovered *in-situ*, we cannot determine whether it was located within areas of the excavation associated with the post-hole disturbance. Therefore we cannot exclude the likelihood of vertical movement of this contact artefact within SU 1. Likewise, the NZA32470 radiocarbon sample that returned a date of 1436–1490 cal AD was taken from the north western corner of SQG25 in the concentrated area of postholes where there was the highest likelihood of vertical movement (Table 3). Owing to the invisibility of these post-hole features within SU 1 we must take any association of radiocarbon dates with associated cultural materials with some caution. These post-hole features highlight the issue that Indigenous activities cause disturbance to the cultural deposits during the use of rockshelter sites which can create significant interpretation issues for investigating recent archaeological deposits in rockshelters. In spite of this, the bead is still located well within the vertical distribution that also contained contact artefacts and was not an outlier in the overall contact assemblage.



Table 3 Radiocarbon results from Malarrak 1, Malarrak 4 and Bald Rock 1. All samples were charcoal (OxCal 4.2.2).

Sample	S-ANU#	$\delta^{13}\text{C}$	Percent Modern Carbon (pMC)	$^{14}\text{C}$ Age	Depth Below Surface (cm)	Cal. AD 95.40%	Highest probability within 95.4% Range	Mean Age Cal. AD	XU Location of Beads
Bald Rock 1 SQ1 XU5	S-ANU 21427	-32.1884±1	98.305±0.438	135±40	6–7	1668–1780	41.60%	1807	3, 6
Malarrak 1 SQ25 XU6	S-ANU 21412	-35±1	99.188±0.358	65±30	11–15	1810–1921	71.10%	1830	6
Malarrak 1 SQ25 XU6/3	NZA32470	-27±1	94.26±0.21	417±20	11–15	1436–1490	94.00%	1462	6
Malarrak 4 SQ11 XU5	S-ANU 21405	-29±1	97.704±0.458	185±40	0	1720–1819	48.00%	1787	2,3,4

### ***Bead Classification Methodology***

Owing to the lack of published contact bead finds from Indigenous archaeological contexts, our methodology draws on the documentation of beads from the general body of Australian historical archaeological research and international bead classification standards (cf. Allen 1996; Birmingham and Wilson 1987; Casey 2004; Casey and Lowe 2010; Crook 1999; Iacono 1996; Thorp 1990; Varman 2003; Wood 2011). In Australia, historical archaeologists have generally inferred that beads at contact period sites were used for personal use, could be assigned to gender, used in clothing (embroidery), jewellery, or in religious practices (i.e. rosary beads) (cf. Allen 1996; Birmingham and Wilson 1987; Casey 2004; Casey and Lowe 2010; Crook 1999; Thorp 1990; Varman 2003). Crook (1999:56–57) and Iacono (1996:20–23) noted that beads could be made from a high diversity of raw materials, including glass, coral, chalcedony, agate, jet, rose quartz, ceramic, metal, shell, wood, bone, faience, ivory and casein. Beads from these studies have generally been classified by shape, material, colour, and size (Casey and Lowe 2010; Crook 1999; Higginbotham 1991; Iacono 1996).

For this project individual beads were counted and photographed, and attributes of manufacture method, raw material, structure, shape, size, end treatment, colour, diaphaneity, lustre and patination were assessed following Wood (2011:68). Some of these results are presented in the following section. In keeping with the intention of standardising and simplifying bead cataloguing, we adopt Wood's systematic method of classification (which built upon those by Beck 1928; Karklins 1985; Kidd and Kidd 1970; Ross 2003). This is essential for keeping a baseline standard for investigating beads in Australia, and is imperative if data is to be used to contextualise results more widely between

Indigenous and historical archaeological perspectives. We aim to further refine the preliminary classifications through the use of chemical characterisation in the future. This will also aid in assigning production sources and dates to the beads.

### ***Descriptions***

Twenty eight specimens are made of glass, with one manufactured from stone and some of the descriptive attributes are summarised in Table 4. Bead colour groups were derived from Munsell colours and include blue, green, purple, purple-blue, red, red-purple and yellow. Seven beads are clear. Diaphaneity recordings showed that the largest proportion of beads were opaque, with the remainder being transparent, translucent-transparent and translucent-opaque. Patination was low in the assemblage, with only six beads thus affected. This is important to note, as patination is the result of exposure to moisture in the soil, which causes the outer layer to develop a sheen and eventually flake off and can alter colour and diaphaneity recordings (Lawrence 2006:371). Where beads showed heavy patination, they were moistened to facilitate accurate colour and diaphaneity recordings. Shape-wise the assemblage included oblate, tubular and spherical morphologies, with the shape of a drip not able to be assessed. Drips (sometimes called 'splatters') are waste products of the bead making process (Francis 1990:15). Beads were divided into size classes and were classified into the following groups: very large, large, medium, small and not assessable owing to breakage. Size classes were determined from bead diameter following Wood (2011:70). The dominant manufacturing technique was drawn, followed by moulded, wound, lamp wound, with one example each of blown and carved beads; manufacturing method was not able to be assessed

for the drip/splatter. All beads were found to consist of a simple structure. Lustre was found to be dull on eight beads and shiny on 21.

Using stylistic and comparative analyses, the beads were assigned to preliminary types and potential places of production (Table 4). The Wellington Range beads can be divided into eight categories: large lamp wound/wound beads (Figure 7), oblate glass beads and seed beads (Figure 8), bugle beads (Figure 9), blown beads (Figure 10) and a faceted spheroidal mould pressed bead, a carved stone bead (Figure 11) and a drip/splatter (Figure 12). We have assigned broad categories to likely Western European (i.e. Venetian, French and Dutch) and Eastern European (i.e. Czech) bead production centres, which we aim to refine further through the use of chemical characterization.

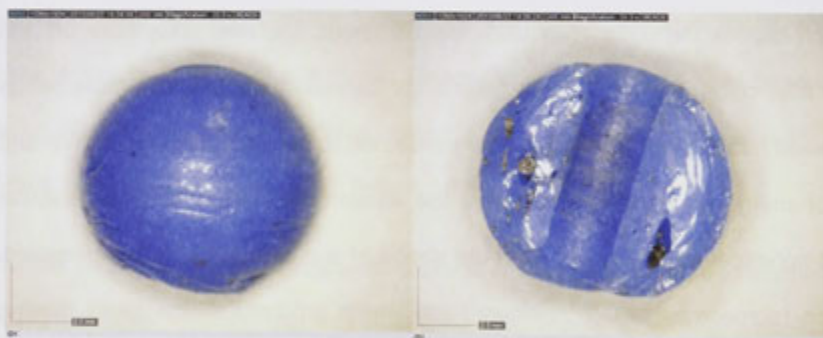


Figure 7. Bead ID1 from the Djulirri site. This is a lamp wound/wound bead.

Table 4 Wellington Range bead assemblage by interpretation, selected descriptive attributes, potential place of manufacture and relationship to radiocarbon dates.

<i>Artefact ID #</i>	<i>Interpretation</i>	<i>Manufacture Method</i>	<i>Size Range</i>	<i>Diaphaneity</i>	<i>Shape</i>	<i>Colour Group</i>	<i>Site and Context</i>	<i>Potential Place of Production</i>	<i>Relationship to Calibrated Radiocarbon Dates Cal AD</i>
1	Wound/lamp wound bead (conjoin #25)	Wound/Lamp Wound	Very large	Opaque	Sphere	Blue	Djulirri, Surface	Western Europe	None
2	Seed bead	Drawn	Large	Opaque	Oblate	Red-Purple	Djulirri, Surface	Western Europe	None
3	Seed bead	Drawn	Large	Opaque	Oblate	Red-Purple	Djulirri, Surface	Western Europe	None
4	Seed bead	Drawn	Small	Translucent-Transparent	Oblate	Green	Djulirri, Surface	Western Europe	None
5	Seed bead	Drawn	Small	Opaque	Oblate	Red-Purple	Djulirri, Surface	Western Europe	None
6	Bugle bead (hexagonal section)	Drawn	Large	Translucent	Tube	Clear	Djulirri, Surface	Western Europe	None
7	Bugle bead (hexagonal section)	Drawn	Large	Translucent	Tube	Clear	Djulirri, Surface	Western Europe	None
8	Seed bead	Drawn	Small	Opaque	Oblate	Yellow	Djulirri, Surface	Western Europe	None
9	Seed bead	Drawn	Small	Translucent-Transparent	Oblate	Purple Blue	Djulirri, Surface	Western Europe	None
10	Seed bead	Moulded	Small	Translucent-Transparent	Oblate	Green	Djulirri, Surface	Eastern Europe	None
11	Seed bead	Moulded	Small	Translucent-Transparent	Oblate	Green	Djulirri, Surface	Eastern Europe	None

<i>Artefact ID #</i>	<i>Interpretation</i>	<i>Manufacture Method</i>	<i>Size Range</i>	<i>Diaphaneity</i>	<i>Shape</i>	<i>Colour Group</i>	<i>Site and Context</i>	<i>Potential Place of Production</i>	<i>Relationship to Calibrated Radiocarbon Dates Cal AD</i>
12	Seed bead	Drawn	Large	Opaque	Oblate	Purple	Djulirri, Surface	Western Europe	None
13	Seed bead	Drawn	Medium	Opaque	Oblate	Red-Purple	Malarrak 4, Sq 11, XU 2	Western Europe	Above 1720-1819 cal AD
14	Oblate glass bead	Drawn	NA	Opaque	Oblate	Yellow	Malarrak 4, Sq 11, XU 3	Unknown	Above 1720-1819 cal AD
15	Oblate glass bead	Wound	Medium	Translucent-Opaque	Oblate	Purple-Blue	Malarrak 4, Sq 11, XU 4	Western Europe	Above 1720-1819 cal AD
16	Stone bead	Carved	Medium	Opaque	Oblate	Yellow	Malarrak 4, Sq 11, XU 4	Unknown	Above 1720-1819 cal AD
17	Oblate glass bead	Drawn	Medium	Translucent-Opaque	Oblate	Purple-Blue	Malarrak 4, Sq 11, XU 6	Unknown	Below 1720-1819 cal AD
18	Glass 'drip' or 'splatter'	NA	NA	Translucent	NA	Purple-Blue	Bald Rock 1, Sq A1, XU 3	Unknown	Above 1668-1780 cal AD
19	Seed bead	Drawn	NA	Opaque	Oblate	Red-Purple	Bald Rock 1, Sq A1, XU 3	Western Europe	Above 1668-1780 cal AD
20	Seed bead	Moulded	Small	Translucent	Oblate	Red	Bald Rock 1, Sq A1, XU 6	Eastern Europe	Below 1668-1780 cal AD
21	Bugle bead (hexagonal section)	Drawn	NA	Translucent	Tube	Clear	Bald Rock 3, Sq 1, XU 2	Western Europe	None
22	Bugle bead (hexagonal section)	Drawn	NA	Translucent	Tube	Clear	Bald Rock 3, Sq 1, XU 3	Western Europe	None
23	Clear blown bead	Blown	NA	Translucent-Opaque	Tube	Clear	Bald Rock 3, Sq 1, XU 4	Western Europe	None

<b>Artefact ID #</b>	<b>Interpretation</b>	<b>Manufacture Method</b>	<b>Size Range</b>	<b>Diaphaneity</b>	<b>Shape</b>	<b>Colour Group</b>	<b>Site and Context</b>	<b>Potential Place of Production</b>	<b>Relationship to Calibrated Radiocarbon Dates Cal AD</b>
24	Clear, blown bead. With end collars.	Blown	Medium	Translucent-Transparent	Sphere	Clear	Bald Rock 3, Sq 1, XU 4	Western Europe	None
25	Wound/lamp wound bead (conjoin #1)	Wound/Lamp Wound	Very large	Opaque	Sphere	Blue	Malarrak 4, Sq 10	Western Europe	None
26	Oblate glass bead	Drawn	Medium	Translucent-Opaque	Oblate	Purple-Blue	Malarrak 4, Sq 5	Western Europe	None
27	Oblate glass bead	Drawn	Small	Translucent-Transparent	Oblate	Purple-Blue	Malarrak 4, Sq 11	Western Europe	None
28	Oblate glass bead	Wound	Small	Opaque	Oblate	Yellow	Malarrak 4, Sq 12	Western Europe	None
29	Bohemian faceted spheroidal mould pressed glass bead	Moulded	Very large	Translucent	Sphere	Clear	Bald Rock 2, Sq 1 XU2	Eastern Europe	None



Figure 8. Examples of beads from the Wellington Range sites; ID2 Djulirri, ID10 Djulirri, ID14 Malarrak 4, ID15 Malarrak 4, ID17 Malarrak 4, ID28 Malrrak 4.



Figure 9. Hexagonal bugle beads (left = ID6; right = ID7) from the Djulirri site.



Figure 10. Bead ID24 from the Bald Rock 3 site. This is a clear blown bead with end collars from Venice, Italy.





Figure 11. Stone carved bead (ID16) from Malarrak 4.



Figure 12. Translucent blue 'drip' or 'splatter' (ID18) from Bald Rock 1.

### ***Bead Assemblage Interpretation***

Taking taphonomic and post-depositional factors into account as addressed earlier, the radiocarbon dates tend to group the bead assemblage strongly with the Macassan and European contact periods. They imply that the beads

recovered from Malarrak 1, Malarrak 4, and Bald Rock 1 were very likely deposited in these sites at some time after the early 18<sup>th</sup> century and possibly up to the early 20<sup>th</sup> century. The two Malarrak 1 dates span a possible period of 485 years. We are not proposing here that the bead from Malarrak 1 is linked to the 1436–1490 cal AD date, but rather that this association is likely the result of post-depositional movement of the bead within this site. Bald Rock 1 also demonstrates that a bead with a likely production date of post-1900 can move downwards in rockshelter cultural deposits, highlighting the difficulty of dating beads by association, an issue raised by bead researchers (e.g. Robertshaw et al. 2014:602). That being said, we argue that the majority of Wellington Range beads are strongly linked to the post-1800 AD period. This conclusion is supported by their association with other contact materials, including flaked and broken glass, ceramics, and iron tools and fragments.

These beads would have become incorporated into the archaeological record via several different mechanisms. Either deposited as singular objects or as constituent of a larger material culture item, traded or gifted to people prior to arrival at the site, and eventually discarded or 'lost'. Alternatively, they may have become incorporated during the process of bead work at the site. The excavation of Bald Rock 1 produced a translucent, intense blue glass 'drip' (Figure 12; sometime referred to as a 'splatter'). Francis (1990:15) noted that beads were commonly strung in preparation for export to indicate to the buyer that the product was fit for purpose, thereby increasing their value. However, they could also be sold loose in bulk, allowing for the purposeful or accidental inclusions of drips, splatters, or 'knots', in the lot. Their presence at Bald Rock 1 does suggest strongly that bead stringing was occurring there; as such refuse arrives in packages of beads, rather than as strung items (Francis 1990:15).

There is no other evidence for contact bead-stringing/work occurring in the Wellington Range, and the only further bead waste products have been found at Red Lily Lagoon, where the bead assemblage contained both knots and drips (Wesley and Litster unpublished data). Whilst these refuse materials have not been found in dated contexts, future chemical characterisation of these artefacts aims to refine the chronology for potential contact bead stringing in the area.

The Wellington Range bead types are diverse and could have served a variety of decorative functions. The bead types represented (e.g. seed, bugle beads and blown beads) are known to have been used in the production of a wide variety of objects during the contact period, from simple string necklaces, chokers, embroidery, and complex decorative beaded designs on items such as bags. Because of the variable uses of these particular bead types and the low sample size present, it is difficult to posit any definitive arguments concerning what material culture these beads originally belonged to.

Potential inter-site use is also able to be briefly commented upon based on the bead data. The two blue broken segments of a lamp wound/wound bead from Malarrak 4 and Djulirri (See Figure 7) appear to conjoin (#1 and #25). The circumstances of how two halves of a single bead came to be deposited at sites separated by 5 km is unknown, but if this is the case it would suggest that both sites were being utilised by the same people. Long-distance exchange of valuable material for personal adornment has been established in Australia (Balme and Morse 2006; McAdam 2009). However, although this bead conjoins, it is also important to consider that the bead manufacturing process could result in stress flaw irregularities resulting in multiple beads fracturing in

the same manner. Therefore at this stage we are counting these two halves as separate artefacts until the broken faces of the bead can be 3D scanned to determine if they are indeed from the same bead.

The vector for bead exchange is difficult to assign, as with all traded items it is difficult to attribute an agent to one particular exchange. The bulk of the beads present at the sites are oblate glass beads of a monochrome drawn type (See Figure 8). The drawn type here were likely produced in Europe (France, central Europe and Venice) in the 19<sup>th</sup> century in large quantities, and thereafter were widely distributed throughout Europe and into South East Asia (Adhyatman and Arifin 1993:89). Small oblate glass beads and seed beads are the type most commonly seen in the choker necklaces depicted in ethnographic photos and collections from Arnhem Land, but are also commonly found at Australian post-contact sites (cf. Allen 1996; Birmingham 1976; Birmingham and Wilson 1987; Crook 1999; Iacono 1996; Thorp 1990; Varman 2003). Therefore attributing an agent to the exchange of particular European beads becomes a complex matter. Additionally, one carved stone bead found at Malarrak 4 (See Figure 11) is not of the local Wellington Range geology. We have tested this bead with HCl, and have confirmed that it is not limestone (Proske pers. comm. March 2014). However, where this particular bead originates and who distributed the object is unknown. We can however eliminate certain bead types as being introduced via Macassan trepangers. This likely includes moulded seed beads which only became incorporated into the South East Asian area post-1900 (Francis 1996:3, 2002:180). Macassan activities along the north Australian coast ceased after Commonwealth legislation forbidding their entry was enacted in 1906–1907, it is therefore unlikely that any moulded seed beads found at the sites were introduced via Macassan trepangers. The remaining bead types

present at the Wellington Range sites are however likely to have been distributed via either Europeans or Macassans.

## Discussion

There has been very little previous elaboration on beads from archaeological contexts in northern Australia, where they are mostly discussed as a component of a general corpus of Macassan trade goods used to assign the sites from which they are recovered to broad temporal categories (Clarke 1994, 2000; Mitchell 1994, 1996). In addition to the contribution they can make to chronology building, Mitchell (1996) suggested that introduced trade goods were accorded a high status by Indigenous people and, as such, were immediately traded to other groups. Thus, beads might potentially also reveal significant information about trade and exchange networks.

The research presented here provides an argument that beads form part of both the Macassan and European culture contact periods. Beads have been found in Macassan trepang processing site contexts and now are clearly shown to be located in nearby rockshelter sites in the Wellington Range. Although there is currently no archaeological evidence of beads from Northern Territory mission settlements, we know from previous research from Wybalenna and Ooldea Soak that beads were part of Christian mission material culture assemblages (Birmingham 1976; Brockwell et al. 1989). Missions did not gain a foothold in western Arnhem Land until the establishment of the Goulburn Island mission, circa 1916, and Oenpelli (now Gunbalunya) in 1925. However, ethnographic, historical, and archaeological evidence provide evidence for beads in Indigenous society in both the pre-Mission and the early Mission era. Accordingly, the mechanisms through which beads have entered Indigenous

society are far more complex than a simple interpretation of their having been distributed by missionaries in the historical period.

We choose to examine these transactions through Altman's hybrid economic model in which goods enter Indigenous society through a complex means of engagement between differing economies. The fact that Tiwi Islanders were demanding 'beads' from Dutch sailors in 1705 illustrates that beads were already highly sought after in the early 18<sup>th</sup> century, suggesting knowledge gained from likely non-European sources, i.e. Macassans or other South East Asian island mariners (Forrest 1995:15-16). We suggest that beads, or beaded items, formed part of a repertoire of exchange items that Indigenous people explicitly sought from their interactions with either Macassan and/or European economies. Altman (2006) contends that this demand is based on a traditional significance that beads held within the Indigenous customary economy. The importance of beaded objects to Indigenous society through to the 20<sup>th</sup> century is testament to the incorporation of the introduced glass beads into customary practice. Furthermore, it is important to examine the importance of the translocation of beads as illustrated through the potential conjoin of ID1 and ID25 recovered from two different sites. This evidence suggests that even if half a bead is of customary value, beads could occupy a different 'place' for the Traditional Owners than they do in Macassan and European economies. This supports the veracity of Altman's theory of 'customary economic value' (2006).

At another level, quantifying bead assemblages in archaeological sites in Arnhem Land may provide an opportunity to assess the level of non-monetised customary practices of Indigenous people which contributed to the Macassan and European market economies. It is important to note that material goods

were being offered in exchange for labour during the period of state sector interactions with Indigenous people. Labour exchange signifies participation in colonial and maritime economies rather than simply as gifting behaviour. The presence of beads is not only likely to represent labour exchange, but may reflect the end result of negotiation for access to land and sea. This is decided by Traditional Owners through customary decision making processes that need to take into account a variety of issues including land rights and sacred sites.

Another aspect of examining the presence of beads in the archaeological record relates to the flexibility of, and changes to, Indigenous technology during the culture-contact period (Hiscock 2008:275–283). Hiscock and Clarkson (2000:103) discussed issues surrounding the impact on introduced materials on stone artefact technologies. They observe the potential for the modification of manufacturing activities in response to the introduction of European and Asian materials and the potential for altering pre-existing technological systems (Hiscock and Clarkson 2000:103). This is very relevant to sites in the Wellington Range, where evidence for bottle-glass flaking occurs at Malarrak 4, Djulirri and Bald Rock 1. Evidence for beads present at Bald Rock 1, unstrung, would suggest that they were arriving at the site for the purpose of beadwork, potentially becoming incorporated or altering existing material culture systems.

Additionally, the presence of beaded objects may also lead to visual transformations in local rock art complexes, where depictions of beads and beaded objects may become incorporated into existing artistic traditions (McDonald and Veth 2012). McAdam (2009) and Chaloupka (1993) observe ancient Indigenous beaded objects depicted in rock art. It is possible that further archaeological evidence for beaded objects are found in the rock art at another

Wellington Range site, Marligur. There are two painted female anthropomorphic figures depicted with 'lines' across the neck area – potentially indicating a beaded necklace or choker (Figure 13). Chaloupka (1993, 1996) further posited that the decorative infill painted on the clothing of these figures was influenced by the diamond designs present in Indonesian textiles and beaded chokers and belts.

It has also been well documented that Indigenous people travelled to and from Sulawesi with Macassans, which would have significantly increased their exposure to island South East Asian material culture, including textiles and beaded objects (Lamilami 1974). The argument for beads and beaded items arriving in Arnhem Land from a Macassan origin is furthered by a resemblance between the style, motif design, choker choice, and beads available in the eastern islands of Indonesia (Departmen Pendidikan dan Kebudayaan 1997) and the historical beaded objects collected in western Arnhem Land donated to the British Museum. The Indigenous chokers found in the British Museum and those shown in Spencer's photographs are arguably very similar in design, construction, and pattern to those found in Sulawesi and surrounds. We acknowledge the ubiquity of such a diamond motif and the similarity in choker designs in varied cultural contexts.





Figure 13. Painted female anthropomorphic figure at Marligur, illustrating possible 'beaded' necklace or choker.

Additionally, as previously mentioned the inclusion of the Makassarese words for beads—*manik-manik* and *manimani*—into local languages is another indicator of the Macassan exchange of these objects (Evans 1992). In an examination of the distribution of maritime loan words around the Indian Ocean, Fuller *et al.* (2011) argued that many languages often prefer a descriptive local word above a foreign loan word, even if the item is introduced. However, in Arnhem Land, Makassarese, Bugis, and Malay words were readily incorporated into local coastal Aboriginal languages for items of introduced material culture (Evans 1992). This highlights an important context for the pre-European introduction of beads into Indigenous society and further serves to illustrate a case for beads and beaded objects being part of an hybrid economy developed between Macassans and Indigenous groups during the trepang industry.

## Conclusion

The Wellington Range beads are typical of those exchanged through South East Asian maritime networks and by European settlers in Australia during the 18<sup>th</sup> to early 20<sup>th</sup> centuries. Although chemical characterisation might further refine where they were produced, the importance here is that their description and presence provide insights into Indigenous-Macassan-European culture-contact and the associated mechanisms of exchange.

We propose that the introduction of beads and/or beaded items to northern Australia began with Macassans in the 18<sup>th</sup> century. There is a chronological overlap of Macassan economies with the expansion of the British into northern Australia in the 19<sup>th</sup> century. The incorporation of beads as a component of the Macassan-Indigenous trade repertoire thereby provided continuity for Indigenous people to obtain specific desirable trade items from their later interactions with European economies. Accordingly, by applying Altman's hybrid economy model, if beads are not simply an exchange for labour, or gifting, they very likely represent the individual expression of customary rights in negotiating with Macassan and European economies. As Altman (2006) indicates, the peculiarities of the situations that arose between Macassans, Europeans, and Indigenous people, beads likely became a specific demand item for Indigenous cooperation and involvement in these non-customary enterprises. The demonstrated archaeological, historical, linguistic, anthropological and ethnographic presence of beads, along with other contact items, supports the model of a hybrid economy of Indigenous interactions existing in western Arnhem Land. While these foreign economies, i.e. trepang fishing, buffalo shooting, pearling, lumber getting and pastoralism, were forced upon

Indigenous people, Altman (2001, 2006, 2007) provided us with a mechanism through which to understand aspects of Indigenous control of, and justification for, these interactions. Rather than the extremes of passive acceptance or violent resistance, Altman's model illuminates the conscious decisions made by Traditional Owners within a customary rights framework. This concerns the extent to which they interacted with others and what their desired outcomes were for such exchanges, such as allowing others to be on their country and to utilise their resources. Without such negotiations, the anticipated customary response would have been continual conflict in response to transgressions on country. Although violence is documented between Indigenous groups, Macassans, and Europeans, this view is balanced by the evidence for cooperation and facilitation as illustrated by the presence of traded items, including the beads recovered from the Wellington Range archaeological sites.

### Acknowledgements

The authors would like to thank the Manganowal Traditional Owners, Ronald Lamilami and his family for their support, guidance and enthusiasm throughout fieldwork from 2008 to 2010. Fieldwork was undertaken by Daryl Wesley and Sue O'Connor for the Australian Research Council funded project *Baijini, Macassans, Balanda, and Bininj: Defining the Indigenous Past of Arnhem Land through Culture Contact* (LP0882985) with contributions from the Linkage Partners Bushfires Council Northern Territory and the Commonwealth Department of Sustainability, Environment Heritage and Water. Jack Fenner (Australian National University) for assisting with fieldwork and post-production of maps. CartoGIS, Jennifer Sheehan for preparing maps. Virginia Das Neves for illustrations of rock art. Jennifer McKinnon (Flinders University) and students undertook excavations and magnetometer field surveys and advised on maritime economies. Tony Barham (ANU) assisted in organising the ARCH8002 field participants. Jasmine Roberston for sorting the Red Lily Lagoon MN05 excavated material. North Australia Research Unit (ANU) supported the project with a base of operations for the fieldwork. We give grateful thanks for assistance from ANU volunteers and students, as well as volunteers from the University of Queensland, Heritage Conservation Branch NRETAS and abroad. Katherine Seikel and Melissa Hetherington (ANU) supervised volunteers laboratory sorting of excavated materials. We extend our thanks to Marilee Wood (University of the Witwatersrand) and Robyn Stocks (Casey and Lowe Pty. Ltd.), for answering many bead questions, and helping to identify some of the beads. Ulrike Proske (ANU) for assistance with HCI testing of the stone bead and geological advice. The authors would like to thank Louise Hamby (ANU)

for discussions about the potential Macassan introduction of glass beads to Arnhem Land and Sally Brockwell (ANU), David Bulbeck (ANU) and Lynley Wallis (Wallis Heritage Consulting) for commenting on an early version of this manuscript. We would like to thank Jeremy Ash (Monash University), Heather Burke (Flinders University) and another two anonymous reviewers for their constructive feedback. All errors contained in this manuscript are our own.

## References

- Adhyatman, S. and R. Arifin 1993 *Manik-Manik di Indonesia: Beads in Indonesia*. Jakarta: Penerbit Djambatan.
- Allen, F.J. 1969 Archaeology and the History of Port Essington. Unpublished PhD thesis, Department of Archaeology, The Australian National University, Canberra.
- Allen, F.J. 2008 *Port Essington: The Historical Archaeology of a North Australian Nineteenth-Century Military Outpost*. Sydney: Sydney University Press.
- Allen, H. and G. Barton 1989 *Ngarradj Warde Djobkeng: White Cockatoo Dreaming and the Prehistory of Kakadu, Northern Territory, Australia*. Sydney: Oceania Publications.
- Allen, K. 1996 A Picture Is Worth A Thousand Artefacts. Investigating the Archaeology of Workers' Camps in New South Wales 1872–1962 using Historic Photographs (Volume 3). Unpublished BA (Hons) thesis, Department of Prehistory and Historical Archaeology, University of Sydney, Sydney.
- Altman, J.C. 1979 The question of affluence: Yolngu economy in northeast Arnhem Land. *Canberra Anthropology* 2(1):1–29.
- Altman, J.C. 2001. *Sustainable development options on Aboriginal land: the hybrid economy in the twenty-first century*. Canberra: Canberra Centre for Aboriginal Economic Policy Research.
- Altman, J.C. 2003. People on country, healthy landscapes and sustainable Indigenous economic futures: The Arnhem Land case. The Drawing Board. *An Australian Review of Public Affairs* 4(2):65-82
- Altman, J.C. 2005 Development options on Aboriginal land: Sustainable Indigenous hybrid economies in the twenty-first century. In *The Power of Knowledge, the Resonance of Tradition*. L. Taylor, G.K. Ward, G. Henderson, R. Davis and L.A. Wallis (eds). pp. 34-48. Canberra: Aboriginal Studies Press.
- Altman, J.C. 2006 *In search of an outstations policy for Indigenous Australia*. Centre for Aboriginal Economic Policy Research, Australian National University. Canberra: CAEPR Working Paper 34.
- Altman, J.C. 2007 Aboriginal economic development. In *The Oxford Companion to Australian Politics*. B. Galligan and W. Roberts (eds). pp.3–5. Melbourne: Oxford University Press.
- Altman, J. 2009 The hybrid economy and anthropological engagements with policy discourse: A brief reflection. *The Australian Journal of Anthropology* 20(3):318-329.
- Anon. 1878 Classified Advertising. Northern Territory Times and Gazette 28 December, p. 1, Accessed 24 August 2013 from <<http://nla.gov.au/nla.news-article3147780Advertisement>>.
- Anon. 1963. Call for Protection: World Interest in Aboriginal Relics. *Dawn, A magazine for the Aboriginal people of N.S.W.* September 12(9), pp.5-6.
- Balme, J. and K.H. Morse 2006 Shell beads and social behaviour in Pleistocene Australia. *Antiquity* 80(310):799–811.

Balme, J. and A. Paterson 2006. Stratigraphy. In *Archaeology in Practice: A Student Guide to Archaeological Analyses*. J. Balme and A. Paterson (eds). pp.97-115. Malden: Blackwell Publishing.

Barrkman, J. 2010 The enduring legacy of Buginese and Makassarese encounters with Indigenous peoples of north Australia. In S. Kuhnt-Saptodewo, D. Pospíšilová and P. Hesser (eds), *Sulawesi and Beyond: The František Czurda Collection*, pp.110-115. Neue Burg: Museum für Völkerkunde.

Beck, H.C. 1928 Classification and nomenclature of beads and pendants. *Archaeologia* 77:10-76.

Bednarik, R.G. 2013 *Creating the Human Past: An Epistemology of Pleistocene Archaeology*. Oxford: Archaeopress.

Berndt, R.M. 1951 Ceremonial exchange in western Arnhem Land. *Southwestern Journal of Anthropology* 7(2):156-176.

Berndt, R.M. and C.H. Berndt 1954 *Arnhem Land: Its History and its People*. Melbourne: F.W. Cheshire.

Berndt, C. 1986. Mondalmi (1910-1969). In *Australian Dictionary of Biography, National Centre of Biography*. Australian National University. Accessed 15 October 2011 <http://adb.anu.edu.au/biography/mondalmi-7622/text13321>

Birmingham, J. 1976 The archaeological contribution to nineteenth-century history: Some Australian case studies. *World Archaeology* 7(3):306-317.

Birmingham, J. and A. Wilson 1987 Regentville Joint Field Project, Artefact Analysis, Interim Report. An unpublished report prepared for the National Estate Grants Programme, NSW Heritage and Conservation Branch, Sydney.

Blair, S. and N. Hall 2013 Travelling the 'Malay Road': Recognising the heritage significance of the Macassan maritime trade route. In M. Clark and S. May (eds), *Macassan History and Heritage: Journeys, Encounters and Influences*, pp.205-226. Terra Australis 29. Canberra: ANU E Press.

Bourke, P. 2000. Late Holocene Indigenous economies of the tropical Australian coast: an archaeological study of the Darwin Region, Unpublished PhD thesis, Department of Anthropology, Northern Territory University.

Bowdler, S. 2002 Hunters and traders in northern Australia. In K.D. Morrison and L. Junker (eds), *Forager-Traders in South and Southeast Asia: Long-Term Histories*, pp.167-184. Cambridge: Cambridge University Press.

Breen, H. 2008 Visitors to northern Australia: Debating the history of Indigenous gambling. *International Gambling Studies* 8(2):137-150.

Brockwell, S. 2009. Archaeological settlement patterns and mobility strategies on the lower Adelaide River, Northern Australia. Oxford: British Archaeological Reports.

Brockwell, S. 2009. *Archaeological settlement patterns and mobility strategies on the lower Adelaide River, Northern Australia*. Oxford, British Archaeological Reports.

Brockwell, S., T. Gara, S. Colley and S. Cane. 1989. The History and Archaeology of Ooldea Soak and Mission. *Australian Archaeology*. 28:55-77.

- Bulbeck, F.D. and B. Rowley 2001 Macassans and their pots in northern Australia. In C. Fredericksen and I. Walters (eds), *Altered States: Material Culture Transformations in the Arafura Region*, pp.55–74. Darwin: Charles Darwin University Press.
- Burke, H and C. Smith. 2004. *The Archaeologists Field Handbook*. Sydney, Unwin and Allen.
- Butzer, K.W. 1982. *Archaeology as Human Ecology: Method and Theory for a Contextual Approach*. Cambridge: Cambridge University Press.
- Casey, M. 2004 Falling through the cracks: Method and practice at the CSR site, Pymont. *Australasian Historical Archaeology* 22:27–43.
- Casey and Lowe 2010 Archaeological Investigation, 50–72 Union Street, Pymont, Volume 1: Main Report. Unpublished report prepared for Charter Hall Holdings.
- Chaloupka, G. 1993 *Journey in Time: The 50,000-year Story of the Australian Aboriginal Rock Art of Arnhem Land*. Chatswood: Reed.
- Chaloupka, G. 1996 Praus in Marege: Makassan subjects in Aboriginal rock art of Arnhem Land, Northern Territory, Australia. *Anthropologie* 34(1–2):131–142.
- Clark, P. and Hope, J. 1985. Aboriginal Burials and Shell Middens at Snaggy Bend and Other Sites on the Central Murray River. *Australian Archaeology* 20:68–89.
- Clark, M. and S.K. May 2013 Understanding the Macassans: A regional approach. In M. Clark and S. May (eds), *Macassan History and Heritage: Journeys, Encounters and Influences*, pp.1–18. Terra Australis 29. Canberra: ANU E Press.
- Clarke, A. 1994 Winds of Change: An Archaeology of Contact in the Groote Eylandt Archipelago, Northern Australia. Unpublished PhD thesis, The Faculties, The Australian National University, Canberra.
- Clarke, A. 2000 Time, tradition and transformations: The negotiation of cross-cultural engagements on Groote Eylandt, northern Australia. In R. Torrence and A. Clarke (eds), *The Archaeology of Difference: Negotiating Cross-Cultural Engagements in Oceania*, pp.142–182. London: Routledge.
- Clarkson, C. 2007. *Lithics in the Land of the Lightning Brothers: The Archaeology of Wardaman Country, Northern Territory*. Terra Australis 25. Acton: ANU E Press.
- Crook, P. 1999 The Meaningless Public Smile? Housing, Mass Consumption and Material Ambiguity in the Rocks, Sydney (c1833–c1931). Unpublished BA(Hons) thesis, Department of Prehistory and Historical Archaeology, University of Sydney, Sydney.
- Curchin, K. 2013 Interrogating the hybrid economy approach to Indigenous development. *Australian Journal of Social Issues*. 48(1):15–34.
- Departmen Pendidikan dan Kebudayaan 1997 *Untian Manik-Manik Nusantara*. Direktorat Jenderal Kebudayaan, Direktorat Permuseuman. Jakarta: Proyek Pembinaan Permuseuman.
- Departmen Pendidikan Nasional 2000 *Manik-Manik Nan Indah Koleksi Museum Negeri Provinsi Irian Jaya*. Departmen Pendidikan Nasional, Bagian Proyek Pembinaan. Permuseuman, Jayapura.

- Direktorat Jenderal Kebudayaan 1997 *Pesona Manik-Manik Khatulistiwa*. Departemen Pendidikan Dan Kebudayaan, Direktorat Jenderal Kebudayaan, Bagian Proyek Pembinaan Permuseuman. Tahun Anggaran, Pontianak.
- Dewar, M. 1995 *The Black War in Arnhem Land: Missionaries and the Yolngu 1908–1940*. Darwin: North Australia Research Unit, The Australian National University.
- Dortch, C. 1979. Australia's oldest known ornaments. *Antiquity* 53:39-43.
- Dortch, 1980. A possible pendant of marl form Devil's Lair, Western Australia. *Records of the Western Australian Museum* 8:401-403.
- Dreyfus, M. and M. Dhulumburrk. 1980. Submission to Aboriginal Land Commissioner regarding control of entry onto seas adjoining Aboriginal land in the Milingimbi, Crocodile Islands and Glyde River area on behalf of the Traditional Owners of the seas in the area and people living at Milingimbi, Ramminginning, Nangalala and associated outstations. Unpublished report prepared for the Northern Land Council, Darwin.
- Evans, N. 1992 Macassan loanwords in Top End languages. *Australian Journal of Linguistics* 12(1):45–91.
- Feary, S. 1996 An Aboriginal burial with grave goods near Cooma, New South Wales. *Australian Archaeology* 43:40–42.
- Forrest, P. 1995 The Tiwi Meet the Dutch: The First European Contacts. An Outline of the History of Tiwi Contact with European Navigators, with Special Reference to the Tiwi Encounter with Dutch Seafarers in 1705. Unpublished report prepared for the Tiwi Land Council.
- Francis, P. 1990 Glass beads in Asia, part two: Indo-Pacific beads. *Asian Perspectives* 29(1):1–23.
- Francis, P. 1996 The Czech glass bead industry today. *The Margaretologist* 9(2):3–7.
- Francis, P. 2002 *Asia's Maritime Bead Trade: 300 BC to the Present*. Honolulu: University of Hawaii Press.
- Fuller, D.Q., N. Boivin, T. Hoogervorst and R. Allaby 2011 Across the Indian Ocean: The prehistoric movement of plants and animals. *Antiquity* 85(328):544–558.
- Ganter, R. 2003 China and the beginning of Australian history. *The Great Circle* 25(1):3–19.
- Ganter, R. 2006 Turning the map upside down. *History Compass* 4(1):26–35.
- Grave, P. and I.J. McNiven 2013 Geochemical provenience of 16<sup>th</sup>–19<sup>th</sup> century CE Asian ceramics from Torres Strait, northeast Australia. *Journal of Archaeological Science* 40(12):4538–4551.
- Gregory, R. L. 1998 Aboriginal settlement patterns in the Ord-Victoria River Region. Unpublished PhD thesis, Department of Anthropology, Northern Territory University.
- Guse, D. L. 2006. Our Home our Country: A Case Study of Law, Land, and Indigenous Cultural Heritage in the Northern Territory, Australia. An unpublished Masters of Aboriginal and Torres Strait Islander Studies, Faculty for Aboriginal and Torres Strait Islander Studies, Charles Darwin University.



Habgood, P.J. and N.R. Franklin. 2008 The revolution that didn't arrive: A review of Pleistocene Sahul. *Journal of Human Evolution* 55(2):187-222.

Habgood, P. J. and N.R. Franklin. 2011 Explanations for patterning in the 'package of traits' of modern human behaviour within Sahul. *Journal of Indo-Pacific Archaeology* 30:14-27.

Hamby, L. 2011 Held by the teeth: Biting bags from Milingimbi. *Journal of Australian Studies* 35(4):511-527.

Hardy, V. 1998 Aboriginal-European Interaction Re-considered: Exploring Potential Directions for an Archaeology of Culture Contact in the Sydney Region. Unpublished PhD thesis. School of Archaeology, The University of Sydney.

Higginbotham, E. 1991 Report on the Interpretation of the Artefact Assemblages from the Australian Hotel, Bunker's Hill, Samson's Cottage and Unwin's Stores, The Rocks, Sydney. Unpublished report prepared for the Sydney Cove Authority.

Hiscock, P. 2008 *Archaeology of Ancient Australia*. London: Routledge.

Hiscock, P. and C. Clarkson 2000 Analysing Australian stone artefacts: An agenda for the twenty first century. *Australian Archaeology* 50:98-108.

Iacono, N. 1996 Cumberland/ Gloucester Streets Site. Archaeological Investigation 1994. Volume 4 Part 4. Specialist Reports, Artefact Report-Miscellaneous. Unpublished report prepared for the Sydney Cove Authority.

Jochim, M.A. 1976 Hunter-Gatherer Subsistence and Settlement: A Predictive Model. New York: Academic Press.

Jochim, M.A. 1979 Breaking Down the System: Recent Ecological Approaches in Archaeology. In *Advances in Archaeological Method and Theory Volume 2*. M. Schiffer (ed). pp. 77-117. New York: Academic Press.

Jones, R. (ed.) 1985 *Archaeological Research in Kakadu National Park*. Special Publication 13. Canberra: Australian National Parks and Wildlife Service.

Johnson, I. 1979. The Getting of Data. A Case Study from the Recent Industries of Australia. PhD thesis, Australian National University, Canberra.

Karklins, K. 1985 *Glass Beads: The 19<sup>th</sup> Century Levin Catalogue and Venetian Bead Book and Guide to Description of Glass Beads*. Ottawa: Parks Canada.

Keen, I. (ed.) 2010 *Indigenous Participation in Australian Economies: Historical and Anthropological Perspectives*. Canberra: ANU E Press.

Kidd, K.E. and M.A. Kidd 1970 A classification system for glass beads for the use of field archaeologists. *Canadian Historic Sites Occasional Papers in Archaeology and History* 1:45-89.

Lamilami, L. 1974. *Lamilami Speaks: The Cry Went Up. A Story of the People of Goulburn Islands, North Australia*. Sydney, Ure Smith.

Lawrence, S. 2006. Artifacts of the Modern World. In *Archaeology in Practice: A Student Guide to Archaeological Analysis*. (eds) J. Balme and A. Paterson. pp. 362-388. Malden: Blackwell Publishing

- Macknight, C.C. 1969 The Macassans: A Study of the Early Trepang Industry along the Northern Territory Coast. Unpublished PhD thesis, Department of Archaeology, The Australian National University, Canberra.
- Macknight, C.C. 1972 Macassans and Aborigines. *Oceania* 42(4):283–321.
- Macknight, C.C. 1973 The nature of early maritime trade: Some points of analogy from the eastern part of the Indonesian Archipelago. *World Archaeology* 5(2):198–208.
- Macknight, C.C. 1976 *The Voyage to Marege-Macassan Trepangers in Northern Australia*. Melbourne: Melbourne University Press.
- Macknight, C.C. 1986 Macassans and the Aboriginal past. *Archaeology in Oceania* (21):69–75.
- Macknight, C.C. 2008 Harvesting the memory: Open beaches in Makassar and Arnhem Land. In P. Veth, P. Sutton and M. Neale (eds), *Strangers on the Shore: Early Coastal Contacts in Australia*, pp.133–148. Canberra: National Museum of Australia.
- Macknight, C.C. 2013 Studying trepangers. In M. Clark and S. May (eds), *Macassan History and Heritage: Journeys, Encounters and Influences*, pp.19–40. Terra Australis 29. Canberra: ANU E Press.
- Macknight, C.C. and A.G. Thorne 1968 Two Macassan burials in Arnhem Land. *Archaeology and Physical Anthropology in Oceania* 3(3):216–222.
- Máñez, K.S. and S.C. Ferse 2010 The history of Makassan trepang fishing and trade. *PloS One* 5(6):e11346.
- May, S.K., P.S.C. Taçon, D. Wesley and M. Travers 2010 Painting history: Indigenous observations and depictions of the 'Other' in northwestern Arnhem Land, Australia. *Australian Archaeology* 71:57–65.
- McAdam, L.E. 2009 Beads across Australia: An Ethnographic and Archaeological View of the Patterning of Aboriginal Ornaments. Unpublished PhD thesis, Archaeology & Palaeoanthropology, School of Humanities, University of New England, Armidale.
- McCarthy, F.D. and F.M. Setzler 1960 *The Archaeology of Arnhem Land*. Sydney: Australian Museum.
- McDonald, J. and P. Veth 2012 Research issues and new directions: One decade into the new millennium. In J. McDonald and P. Veth (eds), *A Companion to Rock Art*, pp.3–14. Oxford: Blackwell Publishing.
- McIntosh, I.S. 1996a Islam and Australia's Aborigines? A perspective from northeast Arnhem Land. *Journal of Religious History* 20(1):53–77.
- McIntosh, I.S. 1996b Can We Be Equal in Your Eyes? A Perspective on Reconciliation from Northeast Arnhem Land. Unpublished PhD thesis, Department of Anthropology, Northern Territory University, Darwin.
- McIntosh, I.S. 2006 A treaty with the Macassans? Burrumarra and the Dholtji Ideal. *The Asia Pacific Journal of Anthropology* 7(2):153–172.
- McIntosh, I.S. 2008 Pre-Macassans at Dholtji? Exploring one of northeast Arnhem Land's great conundrums. In P. Veth, P. Sutton and M. Neale (eds), *Strangers on the*

Shore: *Early Coastal Contacts in Australia*, pp.161–185. Canberra: National Museum of Australia.

McKenzie, M. 1976 *Mission to Arnhem Land*. Adelaide: Rigby.

McNiven, I.J. and L. Russell 2002 Ritual response: Place marking and the colonial frontier in Australia. In B. David and M. Wilson (eds), *Inscribed Landscapes: Marking And Making Place*, pp.27–41. Honolulu: University of Hawai'i Press.

McQueen, R. 2010 Homesickness for a foreign country: Nostalgia and colonisation. *International Journal of Law in Context* 6(3):257–275.

Megaw, J.V.S. 1993 Aboriginal Archaeology of the Sutherland Shire. In *Geography And Geology - Aboriginal Archaeology*. Branagan, D.F. (ed). Pp. 9-12. Sutherland Shire Council.

Mitchell, S. 1994 Culture Contact and Indigenous Economies on the Coburg Peninsula, Northwestern Arnhem Land. Unpublished PhD thesis, Department of Anthropology, Northern Territory University, Darwin.

Mitchell, S. 1996 Dugongs and dugouts, sharptacks and shellbacks: Macassan contact and Aboriginal marine hunting on the Coburg Peninsula, northwestern Arnhem Land. *Bulletin of the Indo-Pacific Prehistory Association, Chiang-Mai Papers* 2(15):181–191.

Morse, K. 1993 Shell beads from Mandu Mandu Creek rockshelter, Cape Range Peninsula, Western Australia, dated before 30,000 bp. *Antiquity* 67(257):877–883.

Mowat, F. 1994 Size really does matter: factors affecting shell size fragmentation. In *Archaeology in the North: Proceedings of the 1993 Australian Archaeological Association Conference*. M. Sullivan, S. Brockwell and A. Webb (eds). pp. 201-212. Darwin: North Australia Research Unit, Australian National University.

Mowat, F. 1995 Variability in Western Arnhem Land shell midden deposits. Unpublished Masters Thesis, Department of Anthropology, Northern Territory University.

National Library of Australia. Axel Poignant Transparency and Photo Collection, Arnhem Land, Northern Territory, 1952 (4389476); Photographs 5396-298; 5396-299, and 5396-300.

Pate, F. D. 2006 Hunter-gatherer social complexity at Roonka Flat, South Australia. In *The Social Archaeology of Australian Indigenous Societies*. B. David, B. Barker and I.J.

McNiven. pp. 226-241. Canberra: Aboriginal Studies Press.

Paterson, A. 2010 The archaeology of historical Indigenous Australia. In J. Lydon and U.Z. Rizvi (eds), *The Handbook of Postcolonial Archaeology*, pp.165–184. Walnut Creek: Left Coast Press.

Paterson, A. 2011 *A Millennium of Culture Contact*. Walnut Creek: Left Coast Press.

Pearson, M. 2005 *Great Southern Land: The Maritime Exploration of Terra Australis*. Canberra: Department of the Environment and Heritage.

Peterson, N. 2003 On the visibility of Indigenous Australian systems of marine tenure. Retrieved 14 August 2013 from <<http://hdl.handle.net/1885/41649>>.

Powell, A. 1982 *A Far Country: A Short History of the Northern Territory*. Melbourne: Melbourne University Press.

Pretty, G.L. 1977 The cultural chronology of the Roonka Flat: A preliminary consideration. In R.V.S. Wright (ed.), *Stone Tools as Cultural Markers: Change, Evolution and Complexity*, pp.288–331. Prehistory and Material Culture Series 12. Canberra: Australian Institute of Aboriginal Studies.

Robertshaw, P., M. Wood, A. Haour, K. Karklins and H. Neff. 2014. Chemical analysis, chronology, and context of a European glass bead assemblage from Garumele, Niger. *Journal of Archaeological Science* 41:591–604.

Ross, L.A. 2003 Bohemian faceted-spheroidal mould-pressed glass bead attributes: Hypothesised terminus post-quem dates for the 19<sup>th</sup> century. *Beads* 15:41–52.

Rowley, B. 1997 *The Makassar Connection: A Descriptive Analysis and Comparison of Macassan and Makassar Earthenwares*. Unpublished BA(Hons) thesis, Department of Archaeology, University of Western Australia, Crawley.

Russell, D. 2004 Aboriginal-Makassan in the eighteenth and nineteenth centuries in northern Australia and contemporary sea rights claims. *Australian Aboriginal Studies* 2004(1):3–17.

Russell, L. 2005 "Either, or, Neither Nor": Resisting the Production of Gender, Race and Class Dichotomies in the Pre-Colonial Period. In *The Archaeology of Plural and Changing Identities: Beyond Identification*. E.C. Casella and C. Fowler. pp.33–54. New York: Kluwer Academic/Plenum.

Schrire, C. 1982 *The Alligator Rivers: Prehistory and Ecology in Western Arnhem Land*. Terra Australis 7. Canberra: ANU E Press.

Silliman, S. 2001 Agency, practical politics and the archaeology of culture contact. *Journal of Social Archaeology* 1(2):190–209.

Steward, J.H. 1938 *Basin-Plateau Aboriginal Socio-political Groups*. Smithsonian Institution, Bureau of American Ethnology Bulletin 120. Washington: United States Government Printing Office.

Steward, J.H. 2006 The Concept and Method of Cultural Ecology. In *The environment in anthropology: a reader in ecology, culture, and sustainable living*. N. Haenn and R.R. Wilk (eds). pp.5–9. New York: New York University Press.

Sutherland, H. 2000 Trepang and wangkang: The China trade of eighteenth-century Makassar ca 1720s–1840s. In R. Tol, K. van Dijk and G. Acciaioli (eds), *Bijdragen tot de Taal-, Land- en Volkenkunde (Authority and Enterprise among the Peoples of South Sulawesi)*, pp.451–472. Leiden: KITLV Press.

Taçon, P.S.C., S.K. May, S.J. Fallon, M. Travers, D. Wesley and R. Lamilami 2010 A minimum age for early depictions of Southeast Asian praus in the rock art of Arnhem Land, Northern Territory. *Australian Archaeology* 71:1–10.

Theden-Ringl, F., J.N. Fenner, D. Wesley and R. Lamilami 2011 Buried on foreign shores: Isotope analysis of the origin of human remains recovered from a Macassan site in Arnhem Land. *Australian Archaeology* 73:41–48.

Thomas, D.H. 1973 An Empirical Test for Steward's Model of Great Basin Settlement Patterns. *American Antiquity*. 38(2):155–176.

- Thomas, D.H. 1989 Diversity in hunter-gatherer cultural geography. In *Quantifying Diversity In Archaeology*. R.D. Leonard and G.T. Jones (eds). pp. 85-91. Cambridge, Cambridge University Press.
- Simak, E. 2007. Australian Aboriginal Necklaces. *Newsletter of the Bead Society of Great Britain* 89:4-7
- Thomson, D. 1949 *Economic Structure and the Ceremonial Exchange Cycle in Arnhem Land*. Melbourne: Macmillan.
- Thorp, W. 1990 Excavations in the House and Yard: Throsby Park Historic Site. Unpublished report prepared for the New South Wales National Parks and Wildlife Service.
- Trudgen, R. 2000 *Why Warriors Lie Down and Die*. Darwin: Aboriginal Resource and Development Services.
- Varman, R.V.J. 2003 Bond 4 East (Area 32) Excavation Catalogue, Part 2: Glass, Metals, Small Finds, Bones, Shell, Stone, Minerals, Mortar and Soil Samples. Unpublished report prepared for Walsh Bay Finance.
- Warner, W. 1932 Malay influence on Aboriginal cultures of northeastern Arnhem Land. *Oceania* 11:476-495.
- Warner, W.L. 1937 *A Black Civilization: A Social Study of an Australian Tribe*. New York: Harper and Brothers.
- Watson-Andaya, B. 2006 Oceans unbounded: Traversing Asia across 'area studies'. *The Journal of Asian Studies* 65(4):669-690.
- Webb, T.T. 1938 *Spears to Spades*. Sydney: Spectator Publishers.
- Welch, D.M. (ed.) 2008 *Kakadu People by Sir Baldwin Spencer*. Australian Aboriginal Culture Series 3. Virginia: David Welch.
- Wells, S. 2003 Negotiating Place in Colonial Darwin Interactions between Aborigines and Whites, 1869-1911. Unpublished PhD thesis, Faculty of Humanities and Social Sciences., University of Technology, Sydney.
- Wesley, D., J. McKinnon and J. Raupp 2012 Sails set in stone: A technological analysis of non-Indigenous watercraft rock art paintings in northwestern Arnhem Land. *Journal of Maritime Archaeology* 7(2):245-269.
- Wood, M. 2011 A glass bead sequence for southern Africa from the 8<sup>th</sup> to the 16<sup>th</sup> century AD. *Journal of African Archaeology* 9(1):67-79.

**Pigment geochemistry as chronological marker: The case of lead pigment in rock art in the Urrmarning 'Red Lily Lagoon' rock art precinct, western Arnhem Land.**

Authors: Daryl Wesley, Tristen Jones and Christian Reepmeyer

Publication: Australian Archaeology

Current status: Published

Coordinated and developed the research project for Red Lily Lagoon 2011 fieldwork. Developed and compiled background research information, rock art chronology, and rock art motif stylistic analysis for the paper. Undertook site and rock art documentation and microscopy in the field. Developed mapping and imagery for the paper. Composed the site description, methods, analysis of pigment elements, discussion and conclusion of this research paper in conjunction with other authors and developed the discussion about Indigenous culture contact and possible sources of the rock art pigment.

Signed: 

Mr. Daryl Wesley

Assisted with research fieldwork at Red Lily Lagoon in 2011 with recording of the rock art site. Contributed to the development of background research, rock art chronology and rock art motif stylistic analysis for this paper. Provided editorial guidance and input into the development of the research paper.

Signed: 

Ms. Tristen Jones

Participated in the Red Lily Lagoon research fieldwork in 2011. Providing pXRF expertise and conducted the pXRF sampling at the site in the field. Conducted the analysis of the elements present in the pigments and bedrock. Provided methods for the pXRF experiment and results of elements. Contributed expertise in the interpretation of the pXRF results with other authors. Also assisted with editorial guidance and input into the development of the research paper, discussion and conclusion.

Signed: 

Dr. Christian Reepmeyer

# Pigment geochemistry as chronological marker:

## The case of lead pigment in rock art in the Urrmarning 'Red Lily Lagoon' rock art precinct, western Arnhem Land

Daryl Wesley, Tristen Jones and Christian Reepmeyer

Archaeology and Natural History, The Australian National University, Canberra ACT 0200, Australia <Daryl.Wesley@anu.edu.au>  
<Tristen.Jones@anu.edu.au> <Christian.Reepmeyer@anu.edu.au>

### Abstract

*This paper presents selected results of an experimental study using portable x-ray fluorescence (pXRF) for the non-destructive analysis of rock art pigments in northern Australia. During two weeks of fieldwork in the dry season of 2011 at the Red Lily Lagoon area in western Arnhem Land, 32 rock art motifs in four rockshelter sites were analysed. A total of 640 analyses were undertaken, including of white, red, black, yellow and blue pigments from both early and contact art motifs. This paper discusses the geochemical analysis of one particular motif painted with black pigment. It was determined that processed metal lead was the most likely pigment base. Contrary to previous stylistic analysis that suggested the motif had an old age, our analysis suggests that the motif was painted within the last 200–300 years.*

### Introduction

Direct dating of most rock art is often unresolved because pigments are inorganic and not suitable for radiocarbon dating and/or because the geology, such as the Kombolgie Sandstone Formation in western Arnhem Land, does not facilitate the use of other direct dating techniques (see Aubert et al. 2007). Establishing age determinations can assist with dating sequences of Aboriginal rock art. Rock art age determinations in Arnhem Land have traditionally been assisted by methods such as superimposition, typology or the archaeological context of inhabited sites.

The earliest evidence for rock art in northern Australia, dated to 28,000 cal. BP, was established through radiometric dating of stratigraphic layers that contained a painted fragment of sandstone from an excavated deposit on the Arnhem Land plateau (David et al. 2012). The current chronology and sequence of rock art in Arnhem Land, however, has been proposed mainly without the aid of direct dating techniques (Brandl 1970; Chaloupka 1984, 1993:89; Chippindale and Taçon 1998:107; Jelinek 1978, 1989; Lewis 1988).

The Red Lily Lagoon area (Urrmarning) in western Arnhem Land of the Northern Territory (NT), has long been recognised as one of the most significant complexes of rock art in the Gunbalanya region (Edwards 1974:136, 1979:51) (Figure 1). Red Lily Lagoon lies on the edge of the extensive freshwater wetlands and plains to the east of the East Alligator River and falls within the Gagudju/Erre/Mangereridji language group zone. Taçon (1993:116) found that Freshwater Period motifs in this zone consisted of an extensive selection of fish (most commonly painted in x-ray and solid/stroke infill), painted hand or hand-and-arm stencils, beeswax compositions, stick figures and energetic style stick figures. This complex of rock art motifs



Figure 1 Location of Minjnyimirlawabu (MN12) within the context of Kakadu National Park and Arnhem Land.



as described by Taçon (1993) was found in abundance in the Urrmarning rock art precinct.

Despite documentation of rock art in the Urrmarning precinct, no geochemical studies of rock art pigments in this study area had previously been conducted (Chaloupka 1993; Gunn 1992; Jelinek 1989; Mountford 1956). Geochemical studies of rock art pigments in general are only infrequently conducted, as they involve controlled destruction of small parts of motifs that are then subject to laboratory analyses (Huntley et al. 2011; Jercher et al. 1998). The application of the non-destructive portable x-ray fluorescence (pXRF) technique in the field remedies this situation, although this approach has significant constraints on precision and accuracy of the geochemical results (Huntley 2012).

In this paper we present data from an experimental pXRF study of the pigments comprising one particular motif, and discuss how low resolution geochemical data can be used to infer meaningful archaeological interpretation if the pigment raw material indicates a non-Indigenous provenance (cf. Cole and Watchman 1993). Our study is part of an ongoing project to develop practical conservation strategies to assist Indigenous rangers and traditional owners in monitoring disturbances to places of cultural significance. The results cast some doubt on previous age determinations by stylistic typology and give evidence for the potential of pXRF to provide important data for the understanding of the chronological sequence of rock art in western Arnhem Land.

### Minjnyimirjdwabu Rockshelter

Our particular focus is the Minjnyimirjdwabu rockshelter (MN12, previously recorded by Gunn [1992] as MN15), located approximately 40 m above the sandy plain on the edge of the sandstone escarpment which is part of the Kombolgie Formation (Plumb and Roberts 1992) (Figure 2). This site is notable for the presence of a 'contact' painting of a sailing ship and several decorative infill hand and forearm paintings, along with a diverse array of painted and beeswax motifs. This particular panel of the sailing ship and painted hand is amongst the most widely publicised examples of this style of rock art.

These paintings have particularly high social significance to the Manilkarr traditional owners owing to personal connection with the painter of these motifs. According

to senior traditional owner, Jacob Nayinggul (dec.) (pers. comm. 2011), the ship and a decorative hand painting to its right were of recent antiquity, having been painted by his adopted father in the early twentieth century. A substantial silty, charcoal rich, cultural deposit with numerous stone artefacts and faunal remains is present on the shelter floor, while grinding hollows and ground surfaces attest to the likely processing of local seeds, plants, fibres and ochre (Jones and Johnson 1985; Meehan et al. 1985).

Panel A in MN12 is on a vertical sandstone face orientated to the northeast and measures approximately 40 m<sup>2</sup>. It consists of 30 clearly identifiable motifs, with evidence for many others obscured by weathering (Figure 3). The subject matter of motifs includes anthropomorphic figures, weapons, x-ray fish, solid infill fish and macropods executed in red, yellow, white and black pigments. Mountford (1956:153) described the anthropomorphic figures as 'supposed to be self-portraits of the Mimi people'.

A sample of these figures was selected for pXRF analysis based on motif pigment colour, thickness and colour diversity, including:

- Motif 1 – a large red male anthropomorphic figure (Figure 3.1);
- Motif 2 – a scene of four or five red anthropomorphic figures (Figure 3.2); and,
- Motif 3 – a large black female anthropomorphic figure (Figure 3.3).



Figure 3 MN12 Panel A with Motifs 1, 2 and 3. Motif 3 is shown in more detail in Figure 4 (Jelinek 1989:173; Mountford 1956:154; Figure 41).

Motif 1 is a vertical figurative depiction of a male individual (displaying genitalia) painted with red pigment in an outline and solid infill method in frontal view. It is depicted with short spears with large rounded ends, a spear thrower and possible 'goose spears' (Chaloupka 1993:148). The motif is uncommonly large, measuring 190 by 120 cm.

Motif 2 consists of a scene composed of line and solid infill human figures. The scene is centred on two human figures that are joined vertically, with another shown upside down.

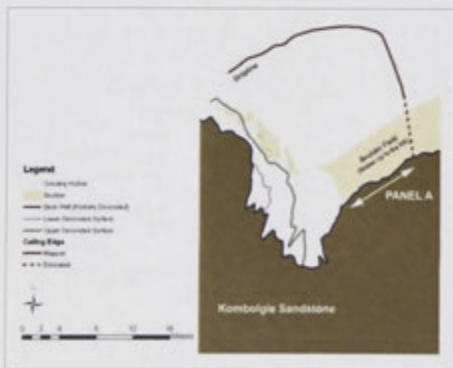


Figure 2 Plan view of Minjnyimirjdwabu (MN12) rockshelter indicating the location of Panel A.



The figures are painted in a characteristic manner common to human figures: static and frontal with outstretched bent arms and legs. The uppermost figure appears to have two smaller human figures around, or attached to, the torso area. All figures are painted in red pigment and have been executed over faded indistinguishable motifs. The motif measures 90 by 40 cm.

Motif 3 is a large anthropomorphic female human figure rendered in a black pigment in a line and solid infill form. Figure 4 reveals further details showing the complexity of painted elements of Motif 3 revealed through D-Stretch filter YBK. This motif is surrounded by other black pigment motifs, however it cannot be ascertained whether these constitute a scene with this motif. This motif is an atypical depiction of a female because there are at least three types of spears painted across the figure from right to left, with one spear painted across the figure from left to right giving the impression the female figure is being 'speared'. This is atypical within the general corpus of Arnhem Land rock art, as male figures have a higher representation of such depictions of 'spearing'. The uppermost spear appears to be a composite 'shovel-nosed' type, with a solid stone or flat wooden point (Chaloupka 1993). That painted across the figure's torso is typical of a uniserial barbed spear (Chaloupka 1984; Lewis 1988). A further three lines are painted diagonally across the torso that resemble a composite three pronged spear, or are perhaps three separate simple spears. A fourth spear is painted diagonally from left to right across the left portions of the figure. An oval shape with small lines protruding from the outer edge of the shape is painted over the right thigh. Unlike Jelinek (1989:173), Mountford (1956:153–154) did not make any reference to the multiple spears that seem to be associated with this figure, nor that it was painted in a black pigment.

#### Antiquity of Motifs According to Taphonomic Indicators and Stylistic Analysis

Classification of anthropomorphic motifs according to form, or 'style', is exceedingly problematic, mainly owing to the appearance of such figures throughout the entire painting sequence (Bednarik 2002:1214). Motifs with non-diagnostic features, such as those lacking individualising forms, methods or stylistic conventions, depicted without material culture, are difficult to allocate to a temporal phase. It is only through mobilising multiple lines of evidence—'cabling', as discussed by Chippindale and Taçon (1998:93)—that assumptions about the antiquity of motifs can be made. Most researchers continue to utilise the revised chronological stylistic sequence for western Arnhem Land presented by Chippindale and Taçon (1998:107), with the basis of art styles originating from Chaloupka (1993). Yet major issues with the chronology remain. Research undertaken in the early 1990s to test the stylistic sequence, for example, recorded the superimposition of all motifs within the Kungurral and Brockman sites in Kakadu National Park (Chippindale and Taçon 1993). The results illustrated that the majority of art within the sample could not be allocated to a Chaloupka style. Other researchers, such as Lewis (1988) and Haskovec (1992), have suggested major changes are required to the sequence owing to major disagreements over particular stylistic sequences.

Mountford (1956) argued that the motifs at Minjyirinjiridawabu could be assumed to have considerable age owing to the use of the term 'Mimi'. This term was used by Indigenous informants to denote art work which

was produced by earlier peoples (Chippindale and Taçon 1998:94), though they also painted Mimi figures themselves. Jelinek (1989:173, Figures 188a and 190a) recorded similar motifs within his Gallery 1 at Inanagurduwil I–III, describing them, 'whether white or red, [as belonging] to the same [Late Archaic] style and probably [coming] from the same period' (see also Jelinek 1989:179). Although he did not specifically refer to black pigment, Jelinek (1989) included these motifs within his general assessment of the panel and it is highly likely he attributed the black pigment motifs to this period as well. Under his chronology, the Late Archaic style was attributed to a period spanning from the Pleistocene to 5000 BP (Jelinek 1989:479–480).

Yet there are several indicators suggesting that the motifs may be much younger. Motif 3 is amongst the last painting events in the sequence of superimposition on the panel. Motif 3 superimposes a number of now significantly weathered motifs, with the weathered non-distinct imagery being polychromatic (yellow, red and white). White and orange pigments are known to have the least permanency, as they do not bond to the rock substrate like pure red pigment and thus are highly susceptible to weathering (Chippindale and Taçon 1998:103). As such, paintings containing white, orange and yellow pigments have been generally assumed by archaeologists to be of a younger age, especially in poor preservation contexts such as MN12.

Motif 1 is a static, full bodied simple figure and, as such, could be diagnostic of numerous styles from the Intermediate (10–6 K) or New Phase (6 K to present), as depictions of large human figures are found throughout these phases (Chippindale and Taçon 1998; Taçon and Chippindale 1994). Assessing the material culture associated with the motif in this case assists in chronological identification (after Lewis 1988). The spears depicted in Motif 1 are typical of ethnographic examples of goose hunting spears (Spencer 1914). This type of technology is commonly associated with the 'Freshwater Period', when magpie geese colonies flourished in the expansive freshwater wetlands (Finlayson et al. 1998; Whitehead et al. 1990).

The non-distinct classification of human motifs also impacts on the stylistic classification of Motifs 2 and 3. The depiction of upwards bent arms and legs in a static and frontal position, as depicted in Motif 2, can be commonly found in anthropomorphic motifs throughout the entire sequence of Arnhem Land art, though it is most common in the late Holocene period (Chaloupka 1993). The material culture in Motif 3 indicates that the motif might be of a younger age. While simple, uniserial and pronged spear types are known to have been utilised throughout the Holocene, shovel-nosed spears or leilira blades are known only to occur in the late Holocene or contact period (Allen 1989; Taçon 1991). It is presumed that the production of shovel-nosed spears was bounded in different social circumstances than the more common smaller projectile points, and indeed, ethnographically, shovel-nosed spears were recorded as part of tribal ritual exchange around Gunbalanya in the 1940s (Allen 1989; Berndt and Berndt 1988).

#### Methods

The rock art motifs selected were analysed by pXRF in three stages for a wide variety of chemical elements *in situ* in the field. For pXRF analyses a Bruker Tracer III-V pXRF was employed, equipped with a rhodium tube, peltier-cooled

Si-PIN detector at a resolution of approximately 170 eV (electron Volt) FWHM at the Mn K peak (5.9 keV [kilo electron Volt] at 1000 counts per second) and a 1024 channel configuration multichannel analyser. Initially, instrument parameters for this case study were 40 keV, 15  $\mu$ A, using 0.1524 mm Cu [copper], 0.0254 mm Ti [titanium] and 0.3048 mm Al [aluminium] filters in the x-ray path, and a 100 second live-time count at 185 FWHM setting. This is the manufacturer recommended setting for higher Z elements (>Fe [iron]) for silicate rocks. Additional analyses were conducted for light elements (Si [silicate], S [sulphur], P [phosphorus], K [potassium], Ca [calcium], Ti, Mn [manganese]) with 15 keV, 15  $\mu$ A without filter for 100 seconds in a vacuum and finally in 'lab-rat mode' with 40 keV, 1.1  $\mu$ A for 180 seconds, also in a vacuum. Interferences from air were minimised by placing the instrument as close as possible to a flat surface of the sample. Net values of the samples were calculated with the Bruker ARTAX Spectra 7.1 package. Nine correction cycles were run for background stripping and peak deconvolution. Presence of elements in the pigment were assessed by subtracting mean net values of three bedrock analyses in close vicinity of the motif and mean net values of four red pigment analyses of underlying rock art motifs. For this study, we refrained from calibrating the net values to actual elemental composition, as the argument is based on qualitative presence/absence of important signature elements for common lead ores in Australia (S [sulphur], Zn [zinc], Ag [silver]).

The difficulties of in situ analysis of rock art pigments have recently been discussed by Forster et al. (2011) and Huntley (2012). The main methodological obstacle is the surface structure of the analysis spot and the critical penetration depth of the x-ray beam<sup>2</sup> (Potts et al. 1997a, 1997b). As the penetration depth of the beam is an equation of the density of the penetrated surface, the energy input for analysis

elements and the mass attenuation coefficient, it is assumed here that for heavier elements only a maximum of ~50% of the count rate is related to the pigment itself (Markowicz 2011). On the other hand, light element geochemistry is particularly difficult to assess in non-laboratory conditions, as the penetration depth of the beam is only a few hundred microns, making it exceedingly susceptible to surface morphology (Forster et al. 2011; Liangquan et al. 1998; Potts et al. 1997a, 1997b). Considering these limitations, it is necessary to analyse not only the pigment itself, but also the underlying bedrock and, in the case of superimposition, the geochemical composition of underlying earlier paintings.

## Results

As shown in Table 1, we report analysis of selected light and heavy elements (Si, P, S, K, Ca, Ti, Mn, Fe, Ni [nickel], Cu, Zn, As [arsenic], Sr [strontium], Zr [zircon], Ag, Sn [tin], Sb [antimony] and Pb [lead]).

## Bedrock

The bedrock of the area is described as quartz sandstones, conglomerates and dolostones intersected with hematitic and brown ferruginous sandstones of the Katherine River Group in the Kombolgie Formation (Ahmad and Scrimgeour 2006; Mitchell et al. 1983; Plumb and Roberts 1992; Smart et al. 1980). As such, it consists mainly of quartz ( $\text{SiO}_2$ ), dolomites, ( $\text{CaMg}(\text{CO}_3)_2$ ), feldspars ( $[\text{K,Na,Ca}]\text{AlSi}_3\text{O}_8$ ) and iron-oxides ( $\text{Fe}_2\text{O}_3$ ). The pXRF analysis detected Si, K, P, S, Ca and Ti in significant amounts in the bedrock. Bearing in mind the limitations of geochemical analysis in non-laboratory conditions, it is suggested that all analyses of elements lighter than Fe, such as Si, P, S, K and Ca (Forster et al. 2011), are quantitatively unreliable. In reference to the possible natural origin of the pigment, Cu, Zn and Ag were detected in the bedrock.

- 1 Analysis spots were selected after assessment of the area with D-Stretch (Harman 2010).
- 2 Equation to calculate penetration depth of x-ray beam:  $t = -\ln(1/10) / ((\mu/p) \cdot \rho) [-\ln(1/10) = 4.61]$ , where  $p$  equals the density of the analysed compound.



Figure 4 MN12 Motif 3 shown with D-Stretch filter YBK for black pigment enhancement.



Figure 5 MN12 Motif 3 illustrating the locations sampled for pXRF.

### Motif 3

The art panel studied contains multiple painting episodes, with the black Motif 3 underlain by red pigment motifs. Figure 5 illustrates the locations from which pXRF samples were taken on Motif 3. The geochemical composition and its colour suggest that iron-oxide (e.g. hematite) is the main constituent of the underlying red pigment. Comparatively high counts of iron and sulphur were detected in Motif 3. Some amount of lead was also identified in the analysis (Table 1); however, it is unclear whether this originates from weathering of the black pigment.

Initially, it was assumed that the black pigment consisted of charcoal or a manganese-oxide, as these materials have been previously reported for western Arnhem Land rock art and elsewhere (Chaloupka 1993; Huntley et al. 2011). Manganese, however, was not detected in amounts exceeding the background readings. Elements identified with significant higher counts than underlying bedrock or red pigment are Si, As<sup>3</sup> and Pb (Table 1). As discussed before, net values of Si are dismissed as either machine-induced or as a weathering product of the underlying sandstone. The main constituent of the black pigment is Pb, although without significant amounts of S and Zn, elements commonly associated in Australian natural lead mineralisation, suggesting processed metal lead as the most likely source of the raw material (Geoscience Australia 2004). The identification of

lead in the pigment is supported by analysis of several spots with less black pigment cover (Figures 6A and 6B), reducing significantly the amount of lead detected (Table 1).

### Discussion

#### Naturally Occurring Lead Sources

Natural occurring near-surface lead deposits have been reported across Australia. The most common lead mineral with a dark grey streak is galena (PbS). In Australia, surface deposits of galena are usually metamorphic formations, though galena can occur in limestones, sandstones and calc-silicate rocks. Weathering of galena results in carbonated lead minerals, such as cerussites (PbCO<sub>3</sub>), or lead sulphates, such as anglesites (PbSO<sub>4</sub>); however, these minerals can be excluded as a possible source of the pigment, as their streak is white (Deer et al. 1992). In the NT, particularly in the 'Top End', lead ores are usually associated with uranium deposits, the closest to MN12 being the Cahill Formation in the Pine Creek Inlier, which is now mined at the Ranger Uranium Mine (approximately 30 km southwest of Urmanning) where small amounts of lead-zinc ores are

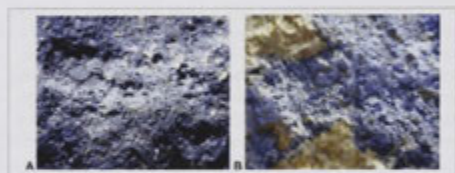


Figure 6 Microphotograph of black pigment showing (A) thick and (B) thin cover.

3 The detection of As in the presence of high Pb with pXRF has been problematic in the past, as the K $\alpha$  peak of As at 10.5 keV and the L $\alpha$  peak of Pb at 10.6 keV overlap to produce a strong interference and result in a significant increase of the detection limits for arsenic.

	Bedrock		Underlying Red Pigment		White Erosion Crust		Black Pigment (Thin)		Black Pigment (Thick)	
	Average (n=4)	SD	Average (n=4)	SD	Average (n=4)	SD	Average (n=3)	SD	Average (n=3)	SD
Si K12	4517	672	3763	495	16,843	8836	6588	2682	20,415	2635
P K12	7768	5440	2245	2509	---	---	122	155	2	1
S K12	1676	1290	5050	1182	949	28	4147	1780	2175	391
K K12	5867	4018	5744	176	2538	49	5569	1324	3017	93
Ca K12	1662	1517	1955	749	615	172	1114	528	2318	211
Ti K12	1122	654	2170	484	269	85	1563	267	1198	850
Mn K12	879	431	880	165	578	154	462	132	770	114
Fe K12	18,883	9714	81,916	13,351	3271	1954	64,046	9737	61,873	26,413
Ni K12	245	30	116	18	133	4	133	8	239	36
Cu K12	110	7	55	8	59	14	63	26	77	15
Zn K12	255	100	103	4	112	5	111	28	318	23
As K12	42	4	55	4	9	2	70	28	452	136
Sr K12	3797	3224	626	74	1589	403	760	70	4281	355
Zr K12	2834	124	411	90	499	318	368	80	1682	265
Ag K12	1715	66	335	34	396	139	439	80	2145	371
Sn K12	694	130	495	95	447	165	555	53	608	259
Sb K12	892	27	537	168	27	21	687	109	760	204
Pb L1	129	64	666	104	19	6	991	192	10,122	2768

Table 1 Summary statistics of net values of MN12 pXRF analysis of bedrock, white erosion crust, hematite and lead pigment, the thicker the black pigment the higher lead counts, indicating that the black pigment indeed is metal lead. The white erosion crust was also measured to assess possible contamination through leaching of lead from the bedrock; no lead was found in the erosion crust.

associated with uranium-oxide mineralisation (Needham 1988). Galena, as well as other common lead mineralisations, can be excluded as potential sources for the pigment, as the pXRF analysis only showed traces of Zn and S comparable with the background amounts, indicating they were associated with the underlying bedrock rather than the pigment.

### Processed Metal Lead

The lack of elements usually associated with natural lead mineralisation indicates that the lead used for painting motifs is more likely to derive from processed metal. It is suggested that procurement of lead pigment most likely resulted from interaction and/or exchange with Macassan, Dutch or other European settlers. Initial contact between Aboriginal groups and Macassans and Dutch explorers is known to have occurred from the 1700s (Allen 2008; Clark and May 2013; Hiscock 2008). Settlement of the Arnhem Land region by British colonists is documented as beginning ca 1839. Indigenous and British interactions in the area intensified with the development of the buffalo hunting industry in the 1890s and is known to have involved the bartering and exchange of high value items, such as metals and tobacco (Powell 1996). Lead was a very common multipurpose metal in colonial times, used variously for minting coins, water pipes, lead-based paints, sheeting, sheathing for hulls, anchor stocks, seals, stamps, tablets, musket balls and shot cartridges (Tripathi et al. 2003; van Duivenvoorde et al. 2013). The largest amounts of lead transported, however, were most likely ship ballast.

It has been well established that there was pre-European evidence of trading with Macassan fishermen and that metals were part of the items exchanged (Clarke 1994; Hiscock 2008; Lamilani 1974; MacKnight 1969, 1986; Mitchell 1994, 1996). MacKnight (1969:223) reported finding a lead ball (possibly a musket ball) at the Anuru Bay Macassan trepang processing site on the northwest Arnhem Land coast. Fredericksen (2003) reported miscellaneous finds of lead musket balls from the colonial Fort Dundas (occupied from 1824–1828) on Melville Island. Evidence of metal in general, mostly tin and iron, has been recovered from excavations and observed on the surfaces of many rockshelters in western Arnhem Land (Chaloupka 1993; Clarke 1994; Guse 1998; Guse and Woolfe 2006; Mitchell 1994; Schrire 1982). Although there have been no reports of lead in these studies, Macassan contact with European traders in the Indonesian archipelago reaches back into the sixteenth century (Knapp and Sutherland 2004).

Apart from minor exploratory incursions, the Red Lily Lagoon area experienced regular European settlement only after 1891. The large Asian water buffalo herds of the East Alligator River were a potentially lucrative enterprise for European settlers in the NT and in 1891 Paddy Cahill became one of the first shooters to move into the area. Aboriginal labour was soon incorporated into buffalo enterprises, and Indigenous people were attracted to Cahill's settlement, where tobacco and meat could be readily obtained (Forrest 1985:87). The incorporation of Aboriginal labour into the buffalo industry starts to be widely reported in the local newspapers during the 1890s (*Northern Territory Times and Gazette*) (Figure 7). By 1897, rifles, shotguns and lead ammunition started to enter into Indigenous ownership in Arnhem Land in large quantities (Wesley 2013). Aboriginal men were typically armed with less expensive, older Martini Henry rifles and shotguns to assist the horse-mounted white shooters to follow up and dispatch the wounded buffalo (Wesley 2013).

We cannot be certain of the exact source of the pigment used in Motif 3 in MN12. We can infer, however, that the lead in the pigment most likely derived from pulverised shotgun ammunition. In Australia and abroad, evidence of trading in shotgun bullets between Indigenous groups and European settlers is scarce. Lead bullets from Martini Henry rifles occasionally occur in archaeological sites, including Leija on the Barkly Tablelands (Ken Mulvaney pers. comm. 2013) and in the Urkuk Village sites in the Duke of York islands (Ian Lilley and Sally Brockwell pers. comm. 2013). Surface artefact assemblages elsewhere at Red Lily Lagoon include flaked glass implements, iron wire, clay pipes, beads and wooden implements worked by metal, all of which demonstrate that European materials were purposely adapted for local use. Excavations on the wider Arnhem Plateau, such as at Malarack rockshelter in the Wellington Range, recovered large amounts of tin, iron and glass. Roberts and Parker (2003:26) documented a cache of material culture at 'Artefact Cave' near Mt Borradaile (Awunbarna), some 40 km to the northeast of Urmarrin, including a Bell and Black matchbox tin (1870), a Macassan adze, a domino piece, a tobacco pipe, a bag of shot (Figure 8), and hand-forged nails and screws.

This research has illustrated the difficulty of placing rock art motifs within a chronological framework regardless of the style in which the motif has been painted. The importance of applying pXRF to this study has allowed us to identify the introduction of a foreign raw material into the material culture of Indigenous society in Arnhem Land, which can be considered as an important chronological 'event marker'. Event markers, along with proliferation events, are significant in the identification of the introduction of new cultural materials (see Hiscock 2008). The growing body of research on Arnhem Land culture contact points to seventeenth century origins for foreign materials entering Arnhem Land (Clarke 1994; MacKnight 1969; Mitchell 1994; Taçon et al. 2010; Theden-Ringl et al. 2010). The use of an introduced material to paint motifs that are irrefutably Indigenous subjects rather than introduced imagery (i.e. ships, guns, Europeans) attests to the difficulty in assigning chronology based solely on style. Without knowledge of the use of lead in the pigment, and based on current assumptions on the introduction of Arnhem Land rock art styles, the age of the black motif could be grossly over-estimated. Estimating motif age is invariably one of the most difficult areas of rock art research in general. Given the evidence presented above, the most likely period for painting Motif 3 coincides with the escalation of English settlement in Arnhem Land from the mid- to late nineteenth century, owing to the introduction of much larger quantities of foreign materials into Indigenous society.

### Conclusion

The application of pXRF to the study of rock art is a relatively recent development in Australian archaeology and is still in its experimental phase (Huntley 2012). However, this study has demonstrated that the use of pXRF can make a meaningful contribution to the study and conservation of rock art. The application of pXRF analysis to one such motif has demonstrated that it, at least, comprises lead rather than some other black substance, such as charcoal or manganese. This discovery has expanded our knowledge of pigment diversity and contributed significantly to a greater chronological understanding of the rock art sequence at Minjivimindjawanu, and indicated that at least some of





**Figure 7** Buffalo shooters (NT Library; Kathryn Brown Collection. Photo Number PH0413/0041).



**Figure 8** Cache of contact materials at a rockshelter near Awunharna to the north of the study area containing a 'bag of lead shot' (photo sourced from <http://www.flickr.com/photos/wisam/3734029464/>).

these motifs, previously assessed as being of substantial antiquity, are clearly younger than a seventeenth century origin. Importantly, it demonstrates that assumptions about chronology based on style alone may be seriously flawed and direct dating is required for the Arnhem Land artistic sequence.

#### Acknowledgements

The authors would like to thank the Nayingull family and Manilagarr traditional owners for their support, guidance and enthusiasm throughout fieldwork. Fieldwork was undertaken by Daryl Wesley with the assistance of the George Chaloupka Fellowship from the Museum and Art Gallery of the NT, kindly funded by ERA Rio Tinto, and of Sue O'Connor

with the ARC Linkage project 'Baigini, Macassans, Balanda and Bininj: Defining the Indigenous Past of Arnhem Land through Culture Contact' (LP0882985), with contributions from the Linkage Partners Bushfires Council NT, the Commonwealth Department of Sustainability, Environment Heritage and Water, and the Office of the Supervising Scientist. Fieldwork was supported by the Division of the Supervising Scientist. Research approvals were granted through the Northern Land Council. Jack Fenner assisted with fieldwork and the post-production of maps. We would like to thank Paul Brugman and Noel Hildago-Tan for fieldwork assistance. Anthropological assistance and interpretations were provided by Eva Purvis and Anna Yeo. Tony Barham assisted in organising the ARCH8002 field participants. The North Australia Research Unit (ANU) supported the project by providing a base of operations for the fieldwork. The authors would like to thank Paul Tacon for commenting on an early version of this manuscript and acknowledge extensive comments by Ben Gunn and the AA Editors. All errors contained in this manuscript are our own.

#### References

- Ahmad, M. and I.R. Scrimgeour 2006 *1:2,500,000 Geological Map of the Northern Territory*. Darwin: Northern Territory Geological Survey.
- Allen, J. 2008 *Port Essington: The Historical Archaeology of a North Australian Nineteenth Century Military Outpost*. Sydney: Sydney University Press.
- Allen, H. 1989 Late Pleistocene and Holocene settlement patterns and environment, Kakadu, Northern Territory, Australia. *Bulletin of the Indo-Pacific Prehistory Association* 9:92–117.
- Aubert, M., S. O'Connor, M. McCulloch, G. Mortimer, A. Watchman and M. Richer-Laflèche 2007 Uranium-series dating rock art in East Timor. *Journal of Archaeological Science* 34(6): 991–996.
- Bednarik, R.G. 2002 The dating of rock art: A critique. *Journal of Archaeological Science* 29(11):1213–1233.
- Berndt, R.M. and C.H. Berndt 1988 *The World of the First Australians. Aboriginal Traditional Life: Past and Present* (5th ed.). Canberra: Aboriginal Studies Press.
- Brandl, E.J. 1970 Arnhem Land X-Ray Art: Part One. Unpublished manuscript. Canberra: Australian Institute of Aboriginal Studies.
- Chaloupka, G. 1984 *From Paleocave to Casual Paintings: The Chronological Sequence of Arnhem Land Plateau Rock Art*. Northern Territory Museum of Arts and Science Monograph Series 1. Darwin: Northern Territory Museum of Arts and Science.
- Chaloupka, G. 1993 *Journey in Time: The 50,000 Year Story of the Australian Rock Art of Arnhem Land*. Sydney: Reed Books Australia.
- Chippindale, C. and P. Tacon 1993 Two old painted panels from Kakadu: Variation and sequence in Arnhem Land rock art. In J. Steinberg, A. Watchman, P. Faudstich and P. Tacon (eds), *Time and Space: Dating and Spatial Considerations in Rock Art Research (Papers of Symposia F and E, AURA Congress Cairns 1992)*, pp.32–56. Occasional AURA Publication 8. Melbourne: Australian Rock Art Research Association.
- Chippindale, C. and P. Tacon 1998 The many ways of dating Arnhem Land rock art, north Australia. In C. Chippindale and P. Tacon (eds), *The Archaeology of Rock Art*, pp.91–111. Cambridge: Cambridge University Press.
- Clarke, A. 1994 *Winds of Change: An Archaeology of Contact in the Groote Eylandt Archipelago, Northern Australia*. Unpublished PhD thesis, School of Anthropology and Archaeology, The Faculties, The Australian National University, Canberra.

- Clark, M. and S.K. May (eds) 2013 *Macassan History and Heritage: Journeys, Encounters and Influences*. Terra Australis 29. Canberra: ANU E Press.
- Cole, N. and A. Watchman 1993 Blue points in prehistory: Preliminary investigations into the use of the blue in Aboriginal rock paintings near Laura, Cape York Peninsula. *Rock Art Research* 10:58–61.
- David, B., B. Barker, F. Petchey, J.-J. Delannoy, G.-M. Geneste, C. Rowe, M. Eccleston, L. Lamb and R. Whear 2012 A 28,000 year old excavated painted rock from Nawarla Gabarnmang, northern Australia. *Journal of Archaeological Science* 40(5):2493–2501.
- Deer, W.A., R.A. Howie and J. Zussman 1992 *An Introduction to the Rock-Forming Minerals* (2nd ed.). New York: Longman Scientific and Technical.
- Edwards, R. 1974 *Australian Aborigines*. Adelaide: Rigby.
- Edwards, R. 1979 *Australian Aboriginal Art: The Art of the Alligator Rivers Region, Northern Territory*. Canberra: Australian Institute of Aboriginal Studies.
- Findlayson, C.M., B.J. Baily, W.J. Freedland and M.R. Fleming 1988 Wetlands of the Northern Territory. In A.J. Comb and P.S. Lake (eds), *The Conservation of Australian Wetlands*, pp.103–126. Norton: Surrey, Beatty and Sons.
- Forrest, P. 1985 An Outline of the History of the Gunbalanya Locality. Unpublished report prepared for FACTS.
- Forster, N., P. Grave, N. Vickery and L. Kealhofer 2011 Non-destructive analysis using pXRF: Methodology and application to archaeological ceramics. *X-Ray Spectrometry* 40(6):389–398.
- Fredericksen, C.F.K. 2003 Archaeology at Fort Dundas, 1975–2000. *Journal of Northern Territory History* 14:1–10.
- Geoscience Australia 2004 Australian Atlas of Minerals Resources, Mines and Processing Centres - the Australian Mines Atlas. Retrieved 28 January 2014 from <http://www.australianminesatlas.gov.au/index.html>.
- Gunn, R.G. 1992 Miking: Rock Art, Myth and Place, Sites of Significance to Jacob Nayinggul. Unpublished report prepared for the Australian Institute of Aboriginal and Torres Strait Islander Studies.
- Guse, D. 1998 Archaeological Survey of Proposed PNC Exploration Program, West Arnhem, Northern Territory, EL 734, 5890, 5891. Unpublished report prepared for the Northern Land Council.
- Guse, D. and R. Woolfe 2006 An Archaeological Survey of the CAMECO 2005 Arrarra Exploration Work Program, West Arnhem Land, Northern Territory. Unpublished report prepared for the Northern Land Council.
- Haskovec, I.P. 1992 Northern running figures of Kakadu National Park: A study of a regional style. In J. McDonald and I.P. Haskovec (eds), *State of the Art: Regional Rock Art Studies in Australia and Melanesia. Proceedings of Symposium C, 'Rock Art Studies in Australia and Oceania' and Symposium D 'The Rock Art of Northern Australia' of the First AURA Congress, Darwin 1988*, pp.148–158. Occasional AURA Publication 6. Melbourne: Australian Rock Art Research Association.
- Hiscock, P. 2008 *Archaeology of Ancient Australia*. London and New York: Routledge.
- Huntley, J. 2012 Taphonomy or paint recipe: In situ portable x-ray fluorescence analysis of two anthropomorphic motifs from the Woronora Plateau, New South Wales. *Australian Archaeology* 75:78–94.
- Huntley, J., A. Watchman and J. Dibden 2011 Characteristics of a pigment art sequence: Woronora Plateau, New South Wales. *Rock Art Research* 28(1):85–97.
- Jelinek, J.J. 1978 Mimi or the archaic art of Arnhem Land. *Archaeology and Physical Anthropology in Oceania* 13(2/3):229–233.
- Jelinek, J.J. 1989 *The Great Art of the Early Australians: The Study of the Evolution and Role of Rock Art in the Society of Australian Hunters and Gatherers*. Brno: Moravian Museum, Anthropos Institute.
- Jercher, M., A. Pring, P.G. Jones and M.D. Raven 1998 Rietveld x-ray diffraction and x-ray fluorescence analysis of Australian Aboriginal ochres. *Archaeometry* 40:383–401.
- Jones, R. and I.P. Johnson 1985 Rockshelter excavations: Nourlangie and Mt Brockman massifs. In R. Jones (ed.), *Archaeological Research in Kakadu National Park*, pp.39–76. Special Publication 13. Canberra: Australian National Parks and Wildlife Service.
- Knapp, G. and H. Sutherland 2004 *Monsoon Traders, Ships, Skippers and Commodities in Eighteenth Century Makassar*. Leiden: KITLV Press.
- Lamilami, L. 1974 *Lamilami Speaks: The Cry Went Up. A Story of the Goulburn Islands, North Australia*. Sydney: Ure Smith.
- Lewis, D.J. 1988 *The Rock Paintings of Arnhem Land, Australia: Social, Ecological and Material Culture Change in the Post-Glacial Period*. BAR International Series S415. Oxford: Archaeopress.
- Liangquan, G., Z. Ye, C. Yeshun and L. Wangchang 1998 The surface geometrical structure effect in situ x-ray fluorescence analysis of rocks. *Applied Radiation and Isotopes* 49(12):1713–1720.
- MacKnight, C.C. 1969 *The Macassans: A Study of the Early Trepanning Industry Along the Northern Territory Coast*. Canberra: The Australian National University.
- MacKnight, C.C. 1986 Macassans and the Aboriginal past. *Archaeology in Oceania* 21:69–75.
- Markowicz, A. 2011 An overview of quantification methods in energy-dispersive x-ray fluorescence analysis. *Pramana - Journal of Physics* 76(2):321–329.
- Meehan, B., S. Brockwell, J. Allen and R. Jones 1985 The wetland sites. In R. Jones (ed.), *Archaeological Research in Kakadu National Park*, pp.103–153. Special Publication 13. Canberra: Australian National Parks and Wildlife.
- Mitchell, J.E., A.S. Mikolajczak and J.M. Fetherston 1983 *Alligator River, Northern Territory. Sheet SD5301*. Canberra: Bureau of Mineral Resources, Geology and Geophysics.
- Mitchell, S. 1994 Culture Contact and Indigenous Economies on the Coburg Peninsula, Northwestern Arnhem Land. Unpublished PhD thesis, Department of Anthropology, Northern Territory University, Darwin.
- Mitchell, S. 1996 Dugongs and dugouts, sharpsticks and shellbacks: Macassan contact and Aboriginal marine hunting on the Coburg Peninsula, northwestern Arnhem Land. *Bulletin of the Indo-Pacific Prehistory Association* 15:181–191.
- Mountford, C.P. 1956 *Records of the American-Australian Scientific Expedition to Arnhem Land, I: Art, Myth and Symbolism*. Melbourne: Melbourne University Press.
- Needham, R.S. 1988 *Geology of the Alligator Rivers Uranium Field, Northern Territory*. Bureau of Mineral Resources, Geology and Geophysics Bulletin 224. Canberra: Geoscience Australia.
- Plumb, K.A. and H.G. Roberts 1992 *The Geology of Arnhem Land, Northern Territory*. Bureau of Mineral Resources Record 1992/55. Canberra: Bureau of Mineral Resources.
- Potts, P.J., P.C. Webb and O. Williams-Thorpe 1997a Investigation of a correction procedure for surface irregularity effects based on scatter peak intensities in the field analysis of geological and archaeological rock samples by portable x-ray fluorescence spectrometry. *Journal of Analytical Atomic Spectrometry* 12:769–776.
- Potts, P.J., O. Williams-Thorpe and P.C. Webb 1997b The bulk analysis of silicate rocks by portable x-ray fluorescence: Effect of sample mineralogy in relation to the size of the excited volume. *Geostandards Newsletter* 21(1):29–41.

- Powell, A. 1996 *Far Country: A Short History of the Northern Territory*. Carlton: Melbourne University Press.
- Roberts, D.A. and A. Parker 2003 *Ancient Ochres: The Aboriginal Rock Paintings of Mount Borradaile*. Marlestone: JB Books Australia.
- Schrire, C. 1982 *The Alligator Rivers: Prehistory and Ecology in Western Arnhem Land*. Terra Australis 7. Canberra: Research School of Pacific and Asian Studies, The Australian National University.
- Smart, P.C., R.S. Needham, P. Fuchs, D.J. Callaghan and R.J. Hughes 1980 *East Alligator, Northern Territory: Sheet 5473*. Canberra: Bureau of Mineral Resources, Geology and Geophysics.
- Spencer, W.B. 1914 *Native Tribes of the Northern Territory in Australia*. London: Macmillan.
- Taçon, P.S.C., S.K. May, S.J. Fallon, M. Travers, D. Wesley and R. Lamilami 2010 A minimum age for early depictions of Southeast Asian praus. *Australian Archaeology* 71:1–10.
- Taçon, P. 1991 The power of stone: Symbolic aspects of stone use and tool development in the western Arnhem Land, Australia. *Antiquity* 65:192–207.
- Taçon, P. 1993 Regionalism in the recent rock art of western Arnhem Land. *Archaeology in Oceania* 28(3):112–120.
- Taçon, P. and C. Chippindale 1994 Australia's ancient warriors: Changing depictions of fighting in the rock art of Arnhem Land, NT. *Cambridge Archaeological Journal* 4:211–248.
- Theden-Ringl, F., J. Fenner, D. Wesley and R. Lamilami 2011 Buried on foreign shores: Isotope analysis of the origin of human remains recovered from a Macassan site in Arnhem Land. *Australian Archaeology* 73:41–48.
- Tripathi, S., G. Parthiban, K.H. Vora, Sundaresh and S.N. Bandodker 2003 Lead ingots from a shipwreck off Poimpur, Tamil Nadu, east coast of India: Evidence for overseas trade and their significance. *The International Journal of Nautical Archaeology* 32:225–237.
- van Duivenvoorde, W., J. Stedman, K. Billström, Z.A. Stos-Gale and M. McCarthy 2013 The lead ingots from the wreck of the *Zuiddorp* (1712), Western Australia: A report on their provenance and manufacture. *The International Journal of Nautical Archaeology* 42(1):150–166.
- Wesley, D. 2013 Firearms in Arnhem Land rock art. *Rock Art Research* 30(2):235–247.
- Whitehead, P.J., B.A. Wilson and D.M.J.S. Bowman 1990 Conservation of coastal wetlands of the Northern Territory of Australia: The Mary River floodplain. *Biological Conservation* 52:85–111.

**Sails Set in Stone: A Technological Analysis of Non-indigenous Watercraft Rock Art Paintings in North Western Arnhem Land.**

Authors: Daryl Wesley, Jennifer McKinnon, and Jason T. Raupp

Publication: Journal of Maritime Archaeology

Current status: Published

Coordinated and conducted the fieldwork in the Wellington Ranges at Malarrak from 2008-2009. Undertook Malarrak site and rock art recording. Developed research questions regarding Indigenous contact with maritime commerce in the Northern Territory, provided Malarrak site description and excavation results. Developed background research of maritime commerce in northern Australia, previous rock art research, and Indigenous history of the area. In conjunction with other authors developed the methodological approach to the recording and analysis of rock art motifs. In consultation with the other authors developed the discussion and conclusion.

Signed:.....

Mr. Daryl Wesley

Participated during 2009-2010 fieldwork seasons in the Wellington Range. Assisted with the recording of rock art motifs investigated in this paper. Provided senior expert maritime archaeological guidance and knowledge to develop the research questions regarding ship technologies in rock art. And develop an appropriate methodology for the analysis of the ship motifs and types with the other authors. In conjunction with other authors worked on defining the results and discussion of the ship characteristics. Provided editorial guidance and input into the development of the research paper and coordination with the journal editors.

Signed:....

Dr. Jennifer McKinnon

Participated during 2009-2010 fieldwork seasons in the Wellington Range. Assisted with the recording of rock art motifs investigated in this paper. Provided expert maritime archaeological opinion and guidance in the recording and analysis of the ship motif characteristics. Compiled the characteristics of maritime technology of each ship motif. In conjunction with other authors developed the results and discussion of the ship characteristics. Provided editorial guidance and input into the development of the research paper.

Signed:....

Mr. Jason T. Raupp



## Sails Set in Stone: A Technological Analysis of Non-indigenous Watercraft Rock Art Paintings in North Western Arnhem Land

Daryl Wesley · Jennifer F. McKinnon · Jason T. Raupp

Published online: 19 September 2012  
© Springer Science+Business Media, LLC 2012

**Abstract** In 2008 researchers from the Australian National University's Archaeology and Natural History Department and Flinders University's Program in Maritime Archaeology recorded nine non-Indigenous watercraft rock art images in a rock-shelter in the Wellington Range of north western Arnhem Land in the Northern Territory. During the project it was recognised that one of the missing elements of interpreting watercraft in rock art was a comprehensive analytical framework that can be tested and reproduced. The development of such a framework can be used by future researchers to begin addressing the larger issues and considerations represented in non-Indigenous watercraft depictions across Australia.

**Keywords** Rock art · Arnhem Land · Indigenous archaeology · Watercraft · Malarrak

### Introduction

In 2008 the Australian Research Council funded the research project entitled *Baiyini, Macassans, Balanda & Bininj* to study the timings and nature of non-Indigenous and Indigenous culture contact through the investigation of archaeological sites in the Wellington Range and Anuru Bay region of north western Arnhem Land in the Northern Territory (NT), Australia. Sites including coastal occupation and living areas, resource extraction and processing areas, rock shelters and rock art sites and the landscape and seascape were all part of the material cultural remains available for exploring these issues. Despite a history of archaeological investigations specifically on Macassan period sites in the area (Macknight 1976; Mitchell 1994), little attention is paid to the region's contact period rock art and what it can contribute to our understanding of the interactions between these different ethnic groups. Further to this point, the rock art motifs that most commonly represent non-Indigenous aspects—watercraft—have been paid even less attention

D. Wesley  
Archaeology and Natural History, Australia National University, Acton, ACT, Australia

J. F. McKinnon (✉) · J. T. Raupp  
Department of Archaeology, Flinders University, GPO Box 2100, Adelaide, SA 5001, Australia  
e-mail: jennifer.mckinnon@flinders.edu.au

(Burningham 1994; Chaloupka 1996; Roberts 2004). An opportunity to record and study watercraft depicted in the rock art of this region presented itself in a collaborative relationship between the Australian National University's Archaeology and Natural History Department and Flinders University's Program in Maritime Archaeology.

This article presents the results of an archaeological recording project conducted in 2009 of the non-Indigenous watercraft imagery in a rock-shelter known as Malarrak. Malarrak is located 12 kilometres inland of the coast in north western Arnhem Land, on the northern side of a sandstone outlier to the north of the Wellington Range (Fig. 1) and on the traditional lands of the Manganowal Traditional Owners. Excavations at Malarrak reveal an Indigenous occupation from 36,728 to 35,156 cal BP (R32137/3) through the early twentieth century. The archaeological deposit contains remains from the exploitation of coastal shellfish species, stone artefacts, glass, pottery, beads and ochre fragments. The

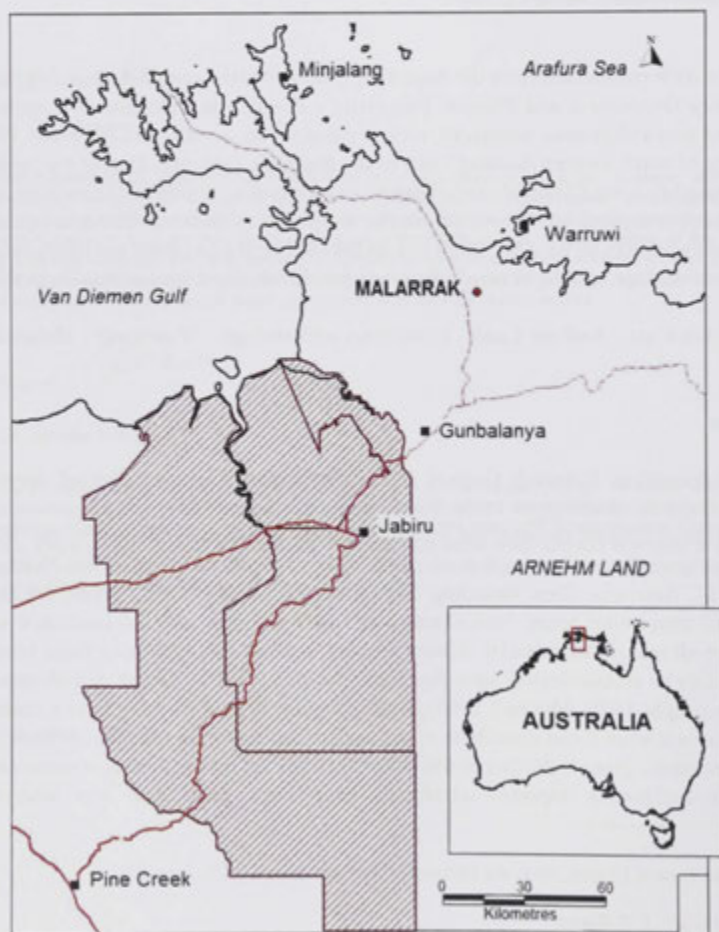


Fig. 1 Location of Malarrak rockshelter, Arnhem Land, Australia

complex of sites at Malarrak also contains over 500 paintings, including many dating to the contact period.

Although some aspects of the contact rock art imagery from Malarrak were previously published (i.e., the Macassan knife, monkey in tree and Trepang smokehouse), other imagery of the rockshelter remains undocumented (Chaloupka 1993, 1996; May et al. 2010) (Fig. 2). The rock art assemblage contains a number of Arnhem Land styles including hand stencils, large human figures, simple figures, X-ray, and complex decorative images. Indigenous motifs at the site include depictions of flying foxes, macropods, frilled neck lizard, goannas, saltwater crocodiles, barramundi (*Lates calcarifer*), forktail catfish (*Arius leptaspis*), yams, lily plants, birds, human figures (male and female) with head dresses and spears. Introduced motifs in the site include watercraft, firearms, buffalo, and a mug, as well as a range of Macassan associated imagery.

A record was made of nine non-Indigenous watercraft rock art motifs from three adjacent rock shelters. This project used standard rock art recording techniques and included both specialists in Indigenous archaeology and rock art and maritime archaeologists specialised in the knowledge of ship construction. This collaborative approach, recognized by others (May et al. 2009), provided a productive environment in which varying specialties could contribute useful knowledge and data for a more complex and fuller understanding of the material culture. During the process it was identified that one of the missing elements of interpreting depictions of watercraft in rock art was a comprehensive, systematic analytical framework that can be tested and reproduced and that is specific to the subject matter. The development of such a framework was the starting point for this research and is outlined below. This article also provides some discussion and conclusions about what images of watercraft depicted in rock art can reveal about the interaction between non-Indigenous and Indigenous groups within this region at the time of contact and beyond; the extent of Indigenous knowledge about watercraft; and potential directions for this type of research. By establishing a systematic framework for analysing water craft it is hoped that future researchers can use and develop it further to begin piecing together the larger issues and considerations represented in non-Indigenous watercraft depictions across Australia.



Fig. 2 A major panel in Malarrak 4 illustrating the range of contact imagery

## Previous Research

An increasing interest within the study of Australian archaeology has been the documentation of Indigenous Australian interactions with colonial Australia (see Veth et al. 2008). Historical and archival records provide one story of Indigenous Australia and archaeological evidence can provide another. It is this period of history that recent archaeological studies in western Arnhem Land are investigating from the early contact with Indonesian seafarers through the early military outposts on the Coburg Peninsula to the later settlement of the NT after 1870 (May et al. 2010, 2011; Taçon et al. 2010). In contrast to the historical documents, the location of Djurlirri (another large rock art gallery located during this research), provided a rich resource of information regarding this period (Taçon et al. 2010). This gallery contains approximately 1300 rock art paintings and illustrates the range of contact Indigenous groups had with European visitors and later settlers. Amongst the paintings are images of Indonesian and European ships and boats which were radiocarbon dated “to have a minimum age of AD 1664” through to the late-nineteenth century (Taçon et al. 2010:6).

Contact period rock art in northern Australia provides a view of Indigenous perceptions and interactions with outsiders and the nature of the culture contact period from the Macassan maritime industry through the time of nineteenth and twentieth century settlement. Nevertheless, contact period motifs have only recently begun to receive the attention due by researchers (Layton 1992; Frederick 1997, 1999). The most recent work on the region's contact period rock art is that of Taçon et al. (2010) and May et al. (2010, 2011). Each of these publications relate to research conducted at sites in western Arnhem Land and represents an approach to establishing both a chronology of the contact imagery and a history of Indigenous interaction with Macassan and Europeans. These studies have raised a number of issues regarding the interpretation of introduced contact imagery, among which include the need for accurate identification of non-Indigenous watercraft. Much of the contact rock art has a specific maritime focus including watercraft, and is an important window into the interaction that Indigenous people had with Macassan fleets and settlements of the time, as well as later periods (Clarke 1994, 2000a, b; Clarke and Frederick 2008; Roberts 2004). Representations of Macassan and European style vessels were documented at sites in several Australian states including Queensland, Western Australia and New South Wales. However, in none of these areas is there such an overwhelming occurrence of them as is found in the NT. Watercraft, such as those at Djurlirri and the ones included in this study, provide a considerable amount of information about the activities and engagement of the contact and later settlement periods in this region. Recording and studying these paintings is significant for our understanding of Indigenous history and the continuity of traditional knowledge and customs in western Arnhem Land.

In general the subjects of ships and seafaring have long captured the imagination of the public, and those depicted in rock art are no exception. Images of Macassan and European vessels depicted in rock art sites around Arnhem Land and Groote Eylandt have featured prominently in popular publications (for example Barrett 1946; Cole 1980; Chaloupka 1993). And while several researchers working in the region provided some description of these types of imagery when encountered, they have generally been treated as one small part of a larger inventory of all motifs within a rock shelter. One of the earliest examples of such inclusion is Turner's (1973) inventory of the rock art of Bickerton Island which offered basic technical descriptions of watercraft, as well as interpretations provided by the island's Indigenous community. Such interpretation became common and illustrations and

descriptions of non-indigenous vessels were generally added as part of a larger discussion of the contact period (Chaloupka 1984; Chaloupka 1988; Layton 1992).

Over the past few decades several publications have emerged with a specific focus on the vessels associated with the seasonal visit to the northern coasts by Macassan voyagers (Burningham 1994; Chaloupka 1996; Burningham 2000; Clarke 2000a; Clarke and Frederick 2006, 2008, 2011). This period in the history of northern Australia is still little understood and these works have made important contributions to understanding how these trips were made possible, and shed some light on cultural interaction. Each of these present discussions of different aspects of the images, including technical and stylistic analyses, as well as interpretations of engagement between Indigenous peoples and Macassans (Burningham 1994, 2000; Chaloupka 1996; Clarke 2000a; Clarke and Frederick 2006, 2008, 2011). Roberts (2004) explores European ships depicted in the rock art of Mt Borradaile, in western Arnhem Land and presents a general inventory of all known European vessels in this area. He also attempts to identify technical and stylistic features to better understand their broader social context (Roberts 2004).

### **Watercraft as Indicators of Contact, Chronology and Significant Events: Establishing a Maritime Presence in Northern Australia**

Chippendale and Taçon (1998) suggest contact rock art imagery can assist with providing dates for the contact period sequence, and ship identification is certainly one of those avenues. However, there are several issues that need to be addressed with regards to the methodology for the identification of a ship depicted in the rock art. It is important to have an in-depth understanding of the history of maritime shipping in the NT, and the encounters between Indigenous and maritime cultures or to employ or collaborate with a maritime historian who specialises in the production of such histories. Without the original Indigenous painter to provide us first-hand details of the painting, we must demonstrate the historical connection between the ship in this region of Arnhem Land, and the method for identifying the particular ship from others that were known to operate in north Australian waters. Thus, below is a brief contextual overview of the maritime activities in the Northern Territory.

Archaeological evidence demonstrates that Indigenous Australians had an established economic relationship with marine resources in northern Australia over many thousands of years (Allen and Barton 1989; Bourke 2000; Brockwell et al. 1995; Clarke 1994; Faulkner 2006; Mitchell 1994). Shell midden deposits and rock art in Arnhem Land illustrate a detailed knowledge and intensive use of marine resources. The archaeological evidence of shellfish utilisation and fish remains also illustrates Indigenous groups knew of seasonality, abundance and distribution of such resources, and that they developed appropriate technologies to hunt, catch, and collect them. Complex traditional ecological and sacred knowledge of the sea and offshore areas also demonstrates well-established maritime traditions in Indigenous society (Morphy 1991; Berndt and Berndt 1954; Lamilami 1974). Unfortunately, other than this knowledge and the presence of archaeological sites dating to after the Holocene sea level rise, evidence for the methods of early coastal voyaging or island crossings remains elusive.

The first European records of Indigenous interaction with maritime technologies and economies in coastal NT waters comes from Captain King's (1827) account of interactions with Indigenous peoples of Goulburn Island. During a prolonged encounter with an Indigenous group on Goulburn Island, Indigenous men at one point attempted to steal



King's longboat; in retaliation his crew took possession of a dugout canoe from an abandoned Indigenous campsite (King 1827). This is one of the earliest references to dugout canoes in possession of Indigenous peoples in Arnhem Land. It has generally been assumed that dugout canoe technology and usage was introduced by the Indonesian trepang fishermen that visited Arnhem Land (Macknight 1976). Indigenous narratives and testimony have supported the likelihood that the dugout canoe was acquired from Indonesian trepang fishermen (Berndt and Berndt 1954; Thomson 1949; Warner 1937).

While the date marking the beginning of the Macassan trade with Indigenous people along the Arnhem Land coast is still debated, historians are largely focussed on a period post-1720, with significant increases in production in the 1780s (MacKnight 1976, 2008). Recent beeswax dates suggest this contact with Indonesian mariners likely began sometime in the mid-seventeenth century (Taçon et al. 2010). Records and stories show that Indigenous men participated in the trepang fishing industry and worked as crew aboard Indonesian sailing vessels (Macknight 1976; Lamilami 1974). One of the more detailed accounts of Macassan maritime material culture came from accounts given by Yolngu informants interviewed at Yirrkala (northeast Arnhem Land) in 1947 and 1949 (Berndt and Berndt 1954). A number of these informants produced detailed crayon drawings with descriptions of items that were brought with the Macassan trepang fishermen. Amongst the descriptions and notes made are details of the trepang fishing and processing equipment, as well as a variety of other items. For example, Drawing 7152, which is held at the National Museum of Australia, is labelled with the following description:

This drawing depicts in plan view a Macassan trepang processing site at Melville Bay, near Yirrkalla, north-eastern Arnhem Land. Praus are sailing in the large harbour, and various Macassan settlements are shown on the shores.

Yolngu correspondents provided 19 specific Macassan loan words for different parts of a sailing vessel, including features such as the anchor, mast, sails, rigging, rudder and cabins. The fact that these drawings and descriptions were made some 40 years after the last Macassans visited north east Arnhem Land is a significant indicator of the intricate knowledge held by the Yolngu regarding maritime material culture. MacKnight (1976:89) later records a similar experience during his fieldwork in the 1960s, stating “many older Aborigines remember the names for different parts of the prau and can point these out on a photograph.”

Thus, when Europeans arrived in Arnhem Land in the nineteenth century, coastal Indigenous peoples were already accomplished mariners using dugout canoes, and a number had developed skills and a familiarity of Macassan maritime sailing technologies. This familiarity with sailing technologies continued to develop when Indigenous peoples of the Coburg Peninsula and surrounding areas interacted with the settlements at Fort Wellington and Port Essington from 1827 to 1849. Records illustrate the close interaction of Indigenous men and sailing vessels and document many going aboard sailing vessels and being employed in various maritime tasks at the settlements (MacGillivray 1852; Mulvaney and Green 1992).

Owing to the late occupation and interest in Australia's north, there was sporadic and minimal European maritime activity until the early 1800s. An early European maritime presence in Australian waters mostly consisted of Royal Navy ships that accompanied the First Fleet. The very first voyages to this region were made on relatively small cutters by Captain Flinders (1814) and Captain King (1827). The early garrisons and settlements at Fort Dundas, Fort Wellington and Port Essington were serviced and occasionally patrolled by a general class of vessel known as a *brig* or *brigantine*. These vessels were typically

sailing ships of the Napoleonic era, two- to three-masted, and usually with a single gun deck. The Royal Navy maintained a presence in NT coastal waters until the abandonment of Port Essington in the 1849; ships that sailed in NT waters include HMS *Britomart*, HMS *Tamar* and HMS *Rattlesnake* (Allen 1972; Calley 1999). There was a 30 year gap in the presence of regular modern European shipping in NT coastal waters until the development of the South Australian colonial outpost of Darwin.

Following the departure of the British colonial settlements, later buffalo shooting, trepang fishing and pearl diving industries develop around the Arnhem Land coastline after the 1870s (Powell 1982). Darwin was established in 1869 to assist with the settlement and economic development of the NT (Bauer 1964; Powell 1982). The settlement was founded in Darwin Harbour which was considered to provide a suitable harbour and anchorage—a feature largely missing from the earlier settlements. A review of contemporary newspapers reveals that major maritime shipping during the colonial period of settlement in the NT consisted mostly of commercial vessels carrying passengers and materials to and from southern ports and Darwin. A fleet of small vessels were permanently stationed in Darwin to work in local maritime commerce and shipping. Minor shipping consisted mostly of local coastal fishing, pearling in particular and supplying remote settlements around the NT coastline to pastoral stations on the Macarthur River and Victoria River. Luggers and schooners appear to be the most common ship utilised in these industries. Buffalo shooting enterprises on the Tiwi Islands, Coburg Peninsula and the Alligator River region also required supply and shipment of hides via small ships (Mulvaney 2004). The early 1900s saw the establishment of a series of Indigenous missions along the NT coastline and islands. The missions were generally serviced by a mission-owned lugger or schooner. Between 1869 and 1911, the South Australian Administration in the NT usually possessed a small steamer or vessel that would carry out government work as necessary for the NT Administrator. This included collecting customs from Indonesian fishermen; police patrols; shipwreck rescues; regular mail runs to missions and pastoral station outposts; government resident doctor inspections; surveying duties; and general colonial government business (Searcy 1907).

During this period Indigenous groups became involved in the various colonial industries and were employed to crew the luggers and schooners that were used to supply various outposts and fishing activities (Lamilami 1974). Although these industries went into decline in the early twentieth century, the establishment of mission settlements along the Arnhem Land coastline necessitated maritime shipping activity. Indigenous crew and skippers operated luggers and smaller craft to supply the settlements of the Methodist and Anglican missions. This is aptly demonstrated at the Goulburn Island mission, especially in a series of photographs taken by Axel Poignant in 1954 (NLA Collection). Mission boats and canoes continued to be used not only for transportation of people between the mainland and islands, but also for traditional hunting and fishing. Therefore, throughout the period of contact with Europeans, the relationship and development of nautical skills and knowledge of maritime technologies and European shipping continued and evolved.

## Methodology

As mentioned above, non-Indigenous watercraft comprises a significant proportion of the motifs represented in Indigenous contact and post-contact rock art. Their study can contribute to understanding the cross-cultural engagement between Indigenous and non-Indigenous visitors and settlers over time (O'Connor and Arrow 2008:400). Additionally,

studies of watercraft can highlight Indigenous knowledge of these visitors and their mode of transportation to, from and within the region. To test these assumptions this study addresses a set of watercraft motifs located in the Wellington Range at the complex of Indigenous rock shelters known as Malarrak. The watercraft depicted range from Macassan prau to sail and steam powered vessels and are presented in different rock art styles.

Though previous studies tended to be less systematic and lacked a representative sample of depictions of boats in rock art (Burningham 1994; Chaloupka 1996; Roberts 2004; O'Connor and Arrow 2008), each has made a significant contribution towards understanding such motifs. For instance, Burningham (1994) provides excellent technical analysis of shipping characteristics of Macassan prau and lugger-rigged vessels in rock art, while Roberts (2004) presents a detailed overview of the general historical implications for depictions of shipping and engagement with Indigenous peoples in Arnhem Land.

This article responds to previous works that lack a methodological framework to incorporate such a framework based on maritime technical and historical knowledge. It argues that a systematic framework for analysing non-Indigenous watercraft motifs, alongside an analysis of context, is crucial for the establishment of an ongoing research agenda in watercraft in rock art. Thus, it is a first attempt at placing non-Indigenous watercraft motifs represented in rock art into a more rigorous framework by which a set of data are tested and falsified or supported quantitatively. This framework is constructed purposefully to be inclusive of all types and features of non-Indigenous watercraft so that it can be used in the future to assess watercraft motifs from Indigenous through contact to post-contact and modern vessels. Further, this framework can be used to analyse relevant motifs across Australia and even around the world. Finally, it can be used to place previous subjective studies of cultural material where motifs are either assessed individually or compared in a non-systematic approach into a systematic framework in which all data can be compared.

To date, relatively little rock art research in Australia has included the expertise of maritime historians or maritime archaeologists. When compared to the amount of iconographic studies that were undertaken by maritime researchers around the world, this lack of collaboration appears mismatched. Maritime and nautical archaeologists have for some time been involved in iconographic studies which tend to focus on ship details, ship types, ship construction and understanding the chronology of ship construction over time—particularly when the physical evidence of ships are not available (McGrail and Anthony 1979; Pritchard 1987; Basch 1989; Mott 1990, 1994; Maarleveld 1995; Kingsley 1997; Langdon and Van de Moortel 1997; Martin 2001; Turner 2007). Thus, this paper not only presents another contribution in the growing area of contact period and post-contact period watercraft rock art through combining areas of specialization, but also increases the scope of work conducted on iconographic studies in maritime and nautical archaeology.

The recording process for this project involved standardized, detailed site recordings of individual motifs and included scaled photographs, measured drawings, Munsell colour readings, orientation, dimension measurements, technique, style, accompanying motifs, super-imposition motifs and condition assessments. The digitized images and measured drawings were then processed and analysed further in the lab. Analysing motifs is complex and includes a number of biases including cultural differences, differences in researcher's expertise and inconsistency between recorders. To minimize the amount of biases, a standardized framework for analysis was necessary. Because no systematic framework for standardizing the analysis of watercraft existed prior to this research, it was imperative to develop this methodological framework.



Thus, a classification framework for simplifying and categorizing the basic components or structural elements of watercraft was necessary for describing and quantifying Indigenous depictions of non-Indigenous watercraft in rock art. This framework was borrowed from maritime archaeologists' frameworks used to describe the technological elements of ships and shipwrecks (Gibbs 2006:6–7). In this study, five 'elements' are identified including: *major structural*, which incorporates the basic structure of the hull and large items that are permanent or integrated within the hull itself; *minor structural*, which incorporates auxiliary pieces of machinery and objects that are large and not normally removed or moveable, but that could be; *fixtures or fittings*, which incorporates the moveable, operable parts of a ship and minor fixed items; *cargo and contents*, which incorporates non-fixed objects that are not associated with ship operation and were meant to be moved or removed; and *people*, which incorporates humans in any capacity from crew to passengers (Table 1). Within each element the watercraft is further reduced to 'features' which more specifically describe the elements. These include: *hull structure*, *superstructure*, *propulsion*, *internal structure*, *mechanical items*, *rigging* and *auxiliary items*. The features are then further elaborated through a list of 'attributes' which are specific items or objects that perform a function. These elements, features and attributes are flexible in that they can be expanded or reduced. They can also be applied to and used for depictions of a range of watercraft from Indigenous to large ocean-going vessels.

The identification of elements, features and attributes is the phase that requires a great degree of expertise in maritime technologies and ship construction. Without this knowledge interpretation is haphazard and incomplete and any attempt to compare watercraft to each other or watercraft across rock art sites compounds these inadequacies. Certainly if a maritime historian, maritime archaeologist, or ship construction specialist is available for corroboration, the results are more nuanced and accurate.

During the analysis of the Malarrak watercraft motifs, the above framework was utilised to identify the presence and absence of technological elements and features represented. A table was compiled that calculated the number of elements and features, and graphs were produced illustrating the relationship between these categories. Where the researchers were uncertain as to the identification or function of a specific feature or attribute a question mark was placed next to the identification; however, these were still included in the total numbers (Table 2).

## Results

In total, nine watercraft were recorded and analysed (see Table 3). The watercraft were identified as to specific types (i.e., schooner, sloop, prau) and ethnic affiliation (i.e., European, Macassan) utilising basic information about ship design, construction and historical narrative. The watercraft motifs were also analysed and interpreted with regard to stylistic attributes.

The survey and analysis revealed a range of vessel types and complexity of detail and style. Though in some cases the images were affected by erosion and water damage, enough of the motif remained to allow the identification of vessel type. Of the nine watercraft depicted, one represents a Macassan prau (W8) (Fig. 3) and likely dates from at least 1650 to the early twentieth century. The remainder of depictions represents European style vessel types, possibly dating from the early nineteenth to the early twentieth centuries. These watercraft include four single-masted sailing vessels (such as cutters or sloops)

**Table 1** Framework outlining distinctive technological elements, features and attributes of watercraft

Elements	Features Attributes
Major structural	<i>Hull structure</i> Hull planking, frames
Minor structural	<i>Superstructure</i> Cabins, wheelhouse <i>Propulsion</i> Engine Boiler, funnel, smoke stack Rudder Anchors, anchor chain Masts <i>Internal structure</i> Decks Bulkheads <i>Mechanical items</i> Auxiliary engines, boilers Winches, windlasses, capstans Pumps
Fixtures or fittings	<i>Rigging</i> Sails Shrouds, forestays, backstays Spars, bowsprits, booms, yards, derricks Halyards, sheets, braces, guys, crosstrees <i>Auxiliary items</i> Tanks Ventilator Steering assembly, steering oars, oars, paddles Davits Portholes, hawse holes Cannons, gun ports Antennas Flags, flag pole Name plates, load numbers
Cargo and contents	Ballast Cargo Ship's boats
People	Crew Passengers

**Table 2** Presence of maritime elements, features and attributes in ship motifs at Malarrak

Elements	Features Attributes	Watercraft 1	Watercraft 2	Watercraft 3	Watercraft 4	Watercraft 5	Watercraft 6	Watercraft 7	Watercraft 8	Watercraft 9
Major structural	<i>Hull structure</i>	x	x	x	x	x	x	x	x	x
	Hull planking, frames									
Minor structural	<i>Superstructure</i>									
	Cabins, wheelhouse			x		x			x	
	<i>Propulsion</i>									
	Engine			x						
	Boiler, funnel, smoke stack			x		x				
	Rudder			x	x				x	
	Anchors, anchor chain								x	
	Masts	x	x		x	x	x	x		x
	<i>Internal structure</i>									
	Decks								x	
	Bulkheads	x				x	x	x	x	x
	<i>Mechanical items</i>									
	Auxiliary engines, boilers									
	Winches, windlasses, capstans				x	x				
	Pumps									
Fixtures or fittings	<i>Rigging</i>									
	Sails	x	x		x		x	x	x	x

**Table 2** continued

Elements	Features Attributes	Watercraft 1	Watercraft 2	Watercraft 3	Watercraft 4	Watercraft 5	Watercraft 6	Watercraft 7	Watercraft 8	Watercraft 9
Cargo and contents	Shrouds, forestays, backstays	x	x	x	x	x	x	x	x	x
	Spars, bowsprits, booms, yards, derricks			x	x	x			x	x
	Halyards, sheets, braces, guys, crosstrees									
	<i>Auxiliary items</i>									
	Tanks									
	Ventilator					x				
	Steering assembly, steering oars, oars, paddles		x							
	Davits									
	Portholes, hawse holes									
	Cannons, gun ports									
	Antennas									
	Flags, flag pole						x	x	x	
	Name plates, load numbers									
	Ballast									
People	Cargo			x		x				
	Ship's boats			x						
	Crew					x				
	Passengers									

**Table 3** Maritime vessel motifs recorded at Malarrak

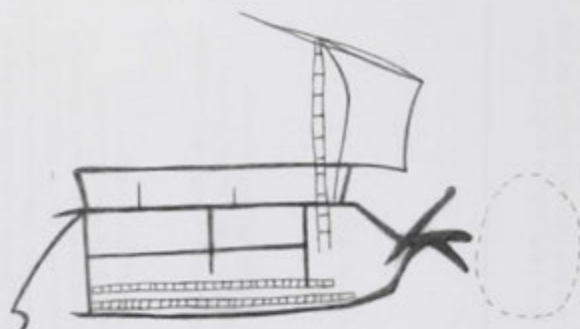
Motif number	Technique and style	Colour	Max dimensions (cm)	Motif description	Interpretation
1	Applied pigment; X-ray; some red outline and line; white outline with some white solid infill	Polychromatic; White/cream: 5YR8/4 Pink: 5YR8/3	36 × 56.5	Single-masted sailing vessel; jib sail; fore & aft mainsail; mast with rounded bulb stepped into keel at midships	Possible Sloop; an earlier motif located in the forward section of the vessel; red lines interpreted as stays, but could be associated with another motif or later outlining of features eroded by water
2	Applied pigment; X-ray; white outline some solid infill	Monochromatic; White/cream: 5YR8/4	41 × 21	Sailed vessel; possibly single-masted with two sails; mast stepped into keel with rounded top; stay connecting mainsail to stern	Possible sloop; heavily eroded; similar in appearance to Watercraft 1; no associated motifs close to the vessel
3	Applied pigment; X-ray; outline and some solid infill	Monochromatic White: 2.5YR8/0	92 × 41	Steam vessel with smoke stack with four sets of double stays; smoke billowing from stack; stack connected to keel; smoke stack stays and supporting rod; rectangular shaped hull; rudder and steering assembly on deck; five box like structures within aft hull; small bowsprit; small ships boat in tow?; unidentifiable feature within forward bow section	Steam vessel under way with smoke; possibly linked to OTL Young Australian; possible forward cabin/deck cargo and an aft wheelhouse; box structures possibly cargo or engine/boiler; appears to be a transom stern
4	Applied pigment; Outline with solid infill; Complex decorative;	Polychromatic; red outline with white line and solid infill Pink: 5YR8/4 White: 2.5YR8/0 Red: 7.5YR3/6 Yellow: 10YR7/6	143 × 127	Sailing vessel; double-masted; three sails and possibly a fourth visible; jib, foresail, mainsail, possible second jib; only one mast visible due to erosion through centre of motif; hull eroded; partial bow and partial transom stern; two rigging lines on jib, one connecting to bowsprit; bowsprit; forward capstan; rudder/steering oar below aft sails; boom on mainsail	Fore and aft rigged sailing vessel; possible schooner, ketch, or lugger; possible rigging lines connected to aft rudder; accompanying motifs: Martini-Henry rifle, buffalo, and kangaroo; other accompanying motifs using same technique (i.e. Martini-Henry rifle)

Table 3 continued

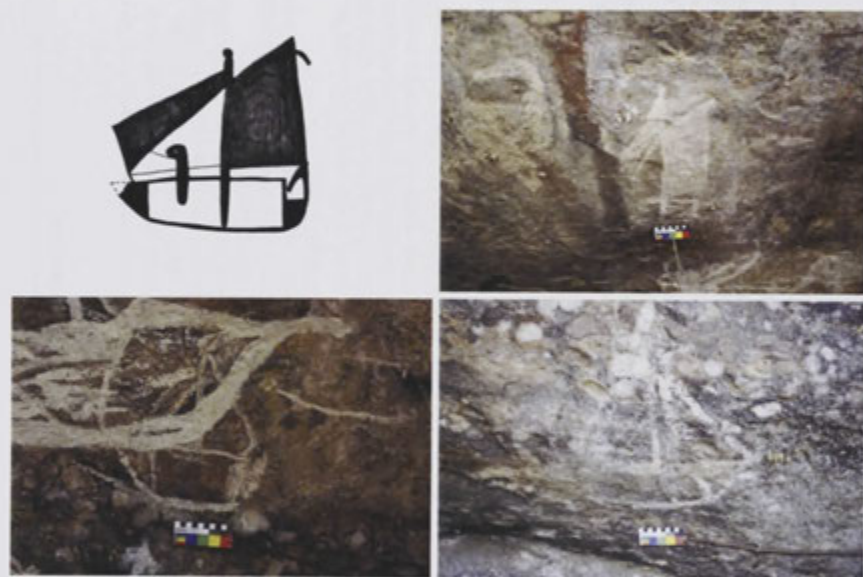
Motif number	Technique and style	Colour	Max dimensions (cm)	Motif description	Interpretation
5	Applied pigment; X-ray; outline with some solid infill	Monochromatic White: 2.5YR8/0	137 × 80	Steam vessel; two masts stepped into keel; smoke stack; aft mast; fore and aft stay topside; fore mast; fore and aft stay topside; structures on deck; two funnels either side of smoke stack; capstan; elevated bow; bowsprit; two human figures painted within the vessel, both hands on hip, one with top hat, and large phallus	Steam vessel; possible porthole or window in stern of the vessel; hull appears to be divided into compartments; human figures possibly added at later date to the vessel; Watercraft 6 located under the vessel; associated motifs: smoking pipes, buffalo
6	Applied pigment; outline with some solid infill	Monochromatic Pink: 5YR8/3	30 × 28	Sailing vessel; single-masted; two stays aft connecting to deck; one forward, top of mast to bow; small line off that stay to deck; round top on mast; bulkheads that create fore and aft with rectangle in centre; one end solid infill	Possibly cutter or sloop; difficult to determine bow from stern; coarse execution of the painting; possible flag off top of mast
7	Applied pigment; outline with some partial solid infill	Monochromatic Pink: 5YR8/3	40 × 47	Sailing vessel; single-masted; fore and aft rig; bowsprit; foresail—unidentifiable markings inside of foresail; mainsail—partial infill with three lines; forward section of hull partial infill; line dividing bow and amidships; possible bulkhead and stanchion; partial line dividing stern and hull; line off end of stern	Possibly cutter or sloop
8	Applied pigment; X-ray; outline with some partial solid infill	Polychromatic: White: 7.5YR8/2 Yellow: 2.5Y8/6	100.5 × 76	High curved bow, flat-keeled vessel; tripod mast forward; steering rudder; bowsprit; internal components of ship depicted; bow; partially eroded at stern	Macassan prau; likely to be at anchor; yellow pigment is a later addition to outline the prau and add a sail; yellow pigment could depict 'rat lines'; indicative of a combination of time periods; possible boxes or materials on deck indicating some sort of superstructure; also may indicate vessel was at anchor and used as a living space; pole on the bow for flying a flag

**Table 3** continued

Motif number	Technique and style	Colour	Max dimensions (cm)	Motif description	Interpretation
9	Applied pigment; outline with some partial solid infill	Monochromatic Yellow: 2.5Y8/6	38 × 31	Partially preserved sailing vessel; two masts (fore and aft) and bowsprit; jib and foresail; stay connecting foremast to end of bowsprit; aft section of boat eroded; sail on forward mast top quarter solid infill; solid infill of bow section	Schooner, lugger, or ketch



**Fig. 3** Watercraft 8 is an example of a Macassan prau



**Fig. 4** Watercraft 1 (*top left*) is a possible sloop; watercraft 2 (*top right*) is a possible sloop; watercraft 6 (*bottom left*) is a possible cutter or sloop; watercraft 7 (*bottom right*) is a possible cutter or sloop

(W1, 2, 6, 7) (Fig. 4), two double-masted sailing vessels (such as luggers, schooners or ketches) (W4, 9) (Fig. 5) and two steam-powered vessels (W3, 5) (Fig. 6).

### Technological

Table 3 demonstrates the specific technological elements, features and attributes of watercraft that may be present or absent in rock art representations. It includes five elements, seven features and thirty attributes; these are hierarchical in that elements are broader, more general categories while attributes are more specific details of watercraft





**Fig. 5** Watercraft 4 (left) and 9 (right) are double-masted vessels and probably represent a schooner, ketch or lugger



**Fig. 6** Watercraft 3 (left) and 5 (right) are steam-powered vessels

construction often linked to a type of vessel (i.e., sailing vessel such as schooner, ketch, etc. or steam vessel).

All of the watercraft demonstrate three of the five elements (*major structural, minor structural and fixtures or fittings*) while only two vessels depict the element *cargo and contents* (W3, 5) and only one vessel depicts *people* (W5) (see Fig. 7). This range might indicate that the three elements depicted in all of the watercraft are significant enough to be repeated time after time in watercraft motifs. When looking at the next categorical level of features it becomes even more obvious what features are important to depicting watercraft. Within this level, all nine of the watercraft depict three features—*hull structure, propulsion and rigging*—each under separate elements. These three features may indicate a basic combination of characteristics needed in the production of a watercraft motif; an idea which will be elaborated in the discussion.

Interestingly, over half of the watercraft depict both *internal structure* (W1, 5, 6, 7, 8, 9) and *auxiliary items* (W3, 5, 6, 7, 8). Within *internal structure* all six include bulkheads or internal compartments as attributes and within *auxiliary items* the attributes are more varied including possible flag poles or flags, steering attributes and a ventilator. Figure 8 illustrates the number of technological attributes present on each watercraft motif. The maximum number of attributes present on a motif is 11 (W5) out of a total of 30, with the least number present being four (W2).

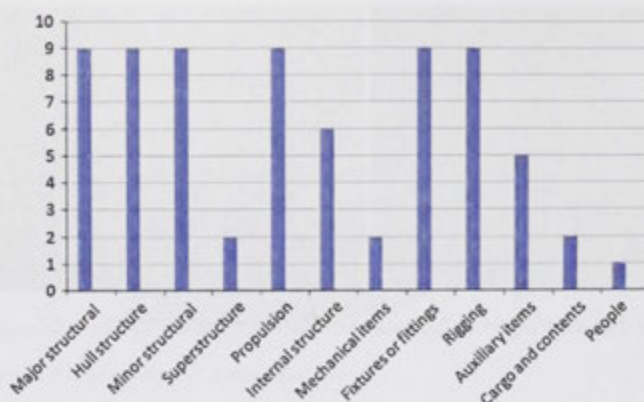


Fig. 7 Distribution of elements and features

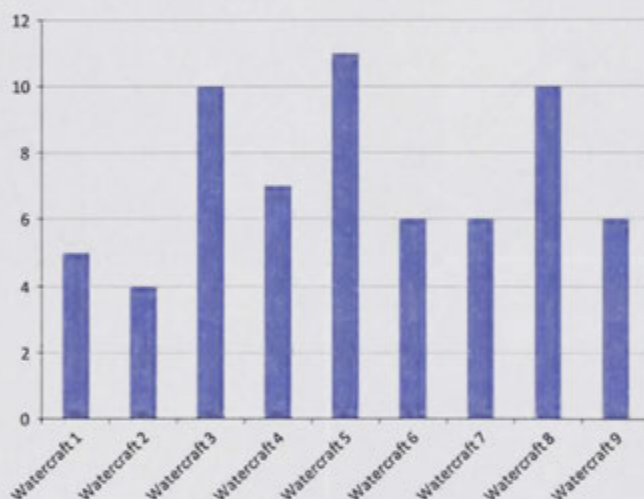
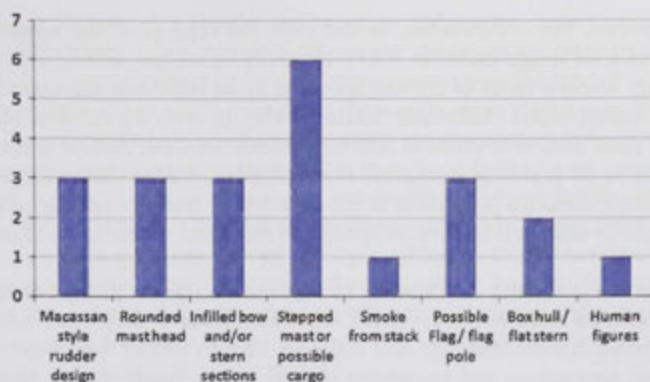


Fig. 8 Presence of maritime attributes identified on each watercraft motif

## Style

Two main styles of rock art are represented in the non-Indigenous watercraft at Malarrak: X-ray and complex decorative. Chaloupka (1993) describes X-ray as a style of rock art in which the internal skeleton and organs of humans and animals are depicted. Complex decorative can be defined as 'line and outline' designs with infill elements and commonly consists of anthropomorphic and zoomorphic figures. This complex decorative manner is applied to the contact imagery owing to the presence of infill and outline design.

Table 2 describes the manner of the painting, pigment colours, details of each motif, and a basic interpretation. Of the nine watercraft depicted, eight are painted in the X-ray style (W1, 2, 3, 5, 6, 7, 8, 9) and one in complex decorative (W4). The X-ray style appears to have been chosen as a way to illustrate features that exist within the hulls or in



**Fig. 9** Distribution of artistic maritime elements

superstructure areas on the decks and may be associated with vessel operations or activities that occurred on-board (Fig. 9). These features include structural elements such as masts stepped into keels, steering mechanisms extending through the stern or elements of rigging (W1, 2, 3, 5, 8); below deck compartments or cargoes and/or possible engines (W3, 5, 6, 7, 8, 9); and human figures (W5). The single motif that falls into the complex decorative category depicts a two-masted sailing vessel outlined in red and completely infilled with white clay, possibly at a later time.

Other notable stylistic features relate to specific attributes of the particular vessels being depicted, to the visible by-products of machinery in use, to a combination of attributes of different vessel types being included in one watercraft motif. Examples of this first category include rounded mast heads depicted on some of the single-masted, European style sailing vessels (W1, 2, 6) and a box-shaped hull and/or flat stern on European style vessels (W2). An interpretation of by-products of machinery in use can be seen in the addition of smoke billowing from the stack of an apparent steam-powered vessel (W3). The other area noted for artistic interpretation pertains to vestigial features and elements of earlier types of vessels being included in depictions of later vessel types—a sort of hybridization process. Examples of this include Macassan-style flag poles and rudders being included in depictions of European style vessels (W1, 3, 4, 6). Another example is the presence of a possible Macassan-style lowered stern platform depicted on a European-style vessel (W1). The idea of a hybridization process raises an important concern in that some vessels were refitted or altered over time. For example, a sailed vessel may have been converted to steam or vice versa. Thus one must be careful when interpreting watercraft imagery to account for these changes or Indigenous knowledge of these changes.

## Discussion

The process of Indigenous artists depicting watercraft in rock art is complex. Unlike a photograph, the artist makes a series of decisions on what information about the vessel is added and left out of the painting. Although we cannot interview the original artist, we can begin to investigate elements of the Indigenous engagement with maritime endeavours and the painting process by examining the presence and absence of elements and features that were included in the watercraft motif. Like all archaeological remains, there is a

transformation process that occurs when, in this case, the concept of the watercraft, is transferred to a rock art image (Schiffer 1987). In this sense we are dealing with behavioural archaeology where a series of choices are made by an individual that contribute to the final archaeological object (Skibo and Schiffer 2008). In order for the final object or artefact to exist, there must be a series of activities, interactions and choices which range from the technical to the performance that are involved in its creation (Skibo and Schiffer 2008). Many of these elements are present in the depiction of maritime rock art; thus it is necessary to create an analytical framework specific to the object or artefact to extract this data.

This article set out to identify and describe in a systematic manner the non-Indigenous depictions of watercraft in the Malarrak shelter in Arnhem Land. It sought to establish an analytical framework and methodology that could be used to extract information about choices, activities, interactions and knowledge on the subject matter. It was hoped this framework could be used in the future to compare the range of watercraft motif types in the Wellington Range with the range of motif types at other sites in the region and across Australia.

### Indigenous Experience and Knowledge of Non-Indigenous Watercraft

Indigenous artists were shown to be adept at depicting various elements of animal morphology, especially in X-ray rock art (Chaloupka 1993). Chaloupka (1993) discusses the Indigenous artist as ecologist and scientific observer. The precise execution of the animal allows the observer to identify not only the generic type of animal, i.e., a fish, but also the specific species, i.e., barramundi (*Lates calcarifer*). It is this principle that was applied to this study of depictions of maritime craft at Malarrak. According to Palmer and Neaverson (1998) archaeologists who study the products of the industrial age (i.e., ships) need to understand the characteristics of the artefacts within the context of the site, region and time. The same principles need to be applied when we are investigating the crossover from the industrialised to the Indigenous. As suggested by Palmer and Neaverson (1998:4) this approach was developed in an attempt to extract the maximum information from material remains by making observations within a 'framework of inference'.

Roberts (2004) has previously linked the depiction of maritime vessels in rock art to Indigenous social history. In this study, the results indicate the Indigenous artist has developed a high level of knowledge regarding the new maritime technologies being introduced to coastal Arnhem Land. The presence of a large number of recognisable elements, features and attributes in the ship motifs is an indicator of the interaction between artists and the watercraft. This was previously identified by Burningham (1994:14);

It seems very likely that the artist who drew these luggers was intimately familiar with the labour that the fore-guy represented. This seems to be a significant characteristic of the northern Australian Aboriginal nautical artists: their art was not developed in a school of 'pier-head artist', rather they were skilled mariners recording aspects of foreign maritime traditions.

Returning to the technological framework, of all the watercraft analysed, each includes the elements: *major structural*, *minor structural* and *fixtures or fittings* and the features: *hull structure*, *propulsion* and *rigging*. As noted above, it is these three elements and features which may comprise the combination of characteristics needed in the production and identification of watercraft imagery. The argument can certainly be made that *ahull*



structure (such as that of a simple outline of an Indigenous canoe) could indicate a watercraft quite clearly; however it does not provide the necessary detail to communicate or move up the ladder of inference to make assumptions about the type of watercraft that the features *propulsion* and *rigging* can detail. To complicate matters it is quite possible for an artist to draw a simple hull which to them might not represent an Indigenous canoe but rather represents a non-Indigenous boat or ship in its basic form or even represents, in the artist's mind, a full rigged ship. This makes interpreting watercraft motifs with regards to type more difficult. Thus, it is difficult for any conclusions to be drawn about a watercraft motif with regards to type, time period or ethnic affiliation if less than two elements or features are represented. This observation then provides a baseline for future research projects and sets a standard for identification which can be reproduced and tested. It also acts as a foundation for which further information about Indigenous knowledge of maritime traditions and watercraft can be sought.

### Historical Narrative in Rock Art

The historical overview presented earlier defines certain periods of possible engagement between Indigenous peoples of Arnhem Land and the Macassan trepang fishermen and Europeans. There appears to be three distinct periods of maritime history: a Macassan trepang fishing period (circa 1720–1906), the early British exploration and settlement (1805–1849) and the later period of colonial settlement post-1870. Each of these periods and cultural groups were accompanied by a specific set of maritime technologies and watercraft types. The Macassan maritime technology remains virtually unchanged over a 200 year period, whereas European maritime technologies change significantly during the nineteenth century, particularly with regards to changes in propulsion from sail to steam. The element and structural analysis presented in this study demonstrates the Indigenous artists' ability to clearly distinguish between maritime technologies. While some of the motifs were interpreted as having included elements from two periods or ethnic watercraft types, this does not indicate a confusion or lack of knowledge on the part of the artist to depict accurate images. It may in fact allude to the artists understanding of the evolution of technologies and types and could represent either a demonstration of this or even a retouch episode.

Roberts (2004:41) lists many recorded instances of Indigenous men participating in the Macassan and European maritime industries. There are numerous references of Indigenous men participating on-board ships as sailors with British shipping at Port Essington. The evidence certainly indicates that Indigenous people had a deep knowledge of a variety of Macassan and European maritime sailing techniques and technology. It is expected that those who sailed and participated in the maritime activities could reproduce a high number of watercraft characteristics whereas those with ephemeral interaction would have a more limited knowledge and thus produce limited elements and features. Therefore a hypothesis can be put forward that Indigenous painters with greater maritime experience were able to reproduce a higher number of ship elements, and vice versa. Through the application of the above analytical framework, this hypothesis could be tested in a regional study of watercraft in rock art. For example, more inland rock shelters where access to the sea was restricted by virtue of geography may include watercraft with fewer elements, features and attributes.

Observations concerning the type of contact, interaction and knowledge specific to watercraft diversity and time periods could also be deduced through a regional analytical approach. In comparison with published depictions of boats across Arnhem Land in areas

such as Mt Borradaile, Red Lily Lagoon, and Nourlangie Rock, the Wellington Range certainly contains the greatest diversity and abundance of watercraft motifs (Roberts 2004; Chaloupka 1993; 1996; Taçon et al. 2010). Though Roberts (2004) states that the maritime rock art of Mt Borradaile is related specifically to the modern period of settlement of the NT, post-1870 into the early twentieth century, maritime motifs found elsewhere at Red Lily Lagoon and Nourlangie Rock also appear to be related to that period as well. However, in the Wellington Range, paintings of watercraft span a much longer time period, from the mid-seventeenth century (Taçon et al. 2011) and also contain a higher diversity of motif types and maritime technological elements. This difference may indicate that the Indigenous occupants of the Wellington Range had greater and more sustained access to shipping during the nineteenth century and certainly during the early contact periods of the mid-seventeenth century.

### Continuity of Rock Art Traditions or Watercraft Attribution?

Through the technological analysis of the watercraft motifs it was determined that six of the nine images included bulkheads or partitions. Bulkheads are wooden or metal lateral dividing walls that separate areas of a ship and may even be watertight. Typically bulkheads separate the cargo area from living spaces or other storage areas such as powder magazines. It was assumed that the inclusion of bulkheads in the X-ray style represented an artist's knowledge of the inner workings of the watercraft. Thus, the notion that a vessel is not a homogenous floating container, but rather a container that has compartments and perhaps differing functions for those compartments is certainly one that could be argued in terms of Indigenous knowledge of watercraft. After contextualizing these motifs with the larger rock art traditions and styles a quandary was presented in that perhaps these were not bulkheads but rather an extension of the tradition of compartmentalizing objects depicted in rock art. In investigating Late Holocene rock art motifs from the Wellington Range, a painting convention is clearly repeated across a range of subject matter; motifs of people and animals have limbs, heads, and tails segmented from the body. It appears that this painting convention continues to be applied to contact imagery with the fore and aft of the ship being segmented from the body or hull of the ship. This might demonstrate a transference of understanding about the Indigenous universe to the new technologies that appear during the contact period and should be read and interpreted with care.

### Conclusion

This study has demonstrated that a comprehensive methodological and analytical framework is necessary for a full understanding of Indigenous depictions of non-Indigenous watercraft in rock art. A technological framework provides a foundation for the identification of watercraft motifs and their composite elements, features and attributes. On the basis of archaeological typologies, generally there must be a minimum number of features present to be able to assign a type to an object—a basic number of one element was identified as necessary for researchers to conclude that an image is in fact a watercraft, but two or more elements or features are necessary to make any conclusions about watercraft type, time period and ethnic affiliation. Further, such a framework is necessary to move into a more interpretive discussion about Indigenous interaction with watercraft and knowledge of maritime traditions. As demonstrated, the importance of sampling a specific part of the archaeological record and analysing it within the context of the greater

archaeological fabric of the site, region and history is important. Information related to specific Indigenous histories or continuity in stylistic traditions are only revealed in this manner.

The methodological and analytical framework presented in this paper is both reproducible and testable and may reveal data about the more complex nature of Indigenous contact and interaction within the coastal regions and with non-Indigenous watercraft. It can be expanded or reduced, however it provides a baseline for identifying motifs as watercraft in the first instance, and secondly can be used in quantifying the level of detail and possibly even knowledge of watercraft by the artist. By utilising such a framework, a more nuanced description and interpretation of the representations is achieved.

**Acknowledgments** This research was undertaken by funding provided by the Australian Research Council Linkage grant LP0882985. The authors would like to acknowledge the following people for their assistance in the fieldwork and preparation of this paper. Traditional Owner Ronald Lamilami, for permission to undertake the field work and use the information for this paper. Field data was collected with assistance from Toni Massey and Kenny Keeping. Field work was facilitated by Ian White, Northern Land Council and the Jabiru Regional Office. Additional assistance in the field was kindly provided by the Office of the Supervising Scientist, NRETAS, and Bushfires Council of the Northern Territory. The final paper has benefited from comments and suggestions made by our colleagues Amy Roberts and Mack McCarthy.

## References

- Allen J (1972) Port Essington: a successful limpet port? *Hist Stud* 15(59):341–360
- Allen H, Barton G (1989) Ngarradj Warde Djokkeng: white cockatoo dreaming and the prehistory of Kakadu, Northern Territory, Australia, Oceania monograph no. 37. Oceania Publications, Sydney
- Barrett C (1946) Coast of adventure: untamed northern Australia. Robertson and Mullens, Melbourne
- Basch L (1989) The way to the lateen sail. *Mar Mirror* 75:328–332
- Bauer FH (1964) Historical geography of white settlement in part of the Northern Territory, Part 2, Katherine–Darwin region, Divisional report no. 64/1. CSIRO Division of Land Research and Regional Survey, Canberra
- Berndt RM, Berndt CH (1954) Arnhem Land: its history and its people. F. W. Cheshire, Melbourne
- Bourke P (2000) Late Holocene Indigenous economies of the tropical Australian coast: Anan archaeological study of the Darwin region. Unpublished PhD thesis, Northern Territory University, Darwin
- Brockwell CJ, Levitus R, Russel-Smith J, Forrest P (1995) Aboriginal heritage. In: Press T, Lea D, Webb D, Graham A (eds) Kakadu: natural and cultural heritage management. ANCA and NARU, Darwin
- Burningham N (1994) Aboriginal nautical art: a record of the Macassans and the pearling industry in the Northern Territory. *Great Circ* 16:139–151
- Burningham N (2000) Sublime but not ridiculous: observations on the technical analysis of ships of first contact represented in various genre of art. *Bull Aust Inst Marit Archaeol* 24:63–70
- Calley G (1999) The pumpkin settlements: agriculture and animals in Australia's first northern colonies. Historical Society of the Northern Territory, Darwin
- Chaloupka G (1984) From paleoart to casual paintings: the chronological sequence of Arnhem Land plateau rock art, Northern Territory Museum of Arts and Sciences Monograph series 1, Darwin, Northern Territory
- Chaloupka G (1988) Groote Eylandt Archipelago rock art survey 1988: report to the Heritage Branch, Conservation Commission of the Northern Territory, N.T. Government, Conservation Commission of the Northern Territory, Darwin
- Chaloupka G (1993) Journey in time: the 50, 000 year story of the Australian rock art of Arnhem Land. Reed Books Australia, Sydney
- Chaloupka G (1996) Praus in Marege: Makassan subjects in Aboriginal rock art of Arnhem Land Northern Territory, Australia. *Anthropologie* 2:131–142
- Chippendale C, Taçon PSC (1998) The many ways of dating Arnhem Land rock art, north Australia. In: Chippendale C, Taçon PSC (eds) The archaeology of rock art. Cambridge University Press, Cambridge, pp 91–111
- Clarke A (1994) Winds of change: an archaeology of contact in the Groote Eylandt archipelago, Northern Australia. Unpublished PhD thesis, Australian National University, Canberra

- Clarke A (2000a) Time, tradition and transformations: the negotiation of cross-cultural engagements on Groote Eylandt, northern Australia. In: Oceania R, Torrence R, Clarke A (eds) *The archaeology in the archaeology of difference: negotiating cross cultural engagements in Oceania*. Routledge, London, pp 1–31
- Clarke A (2000b) "The moormans trowers": Macassan and Aboriginal interactions and the changing fabric of Indigenous social life. In: O'Connor S, Veth P (eds) *East of the Wallace Line: studies of past and present maritime cultures of the Indo-Pacific region*. AA Balkema, Rotterdam, pp 315–335
- Clarke A, Frederick U (2006) Closing the distance: interpreting cross-cultural engagements through indigenous rock art. In: Lilley I (ed) *Archaeology in Oceania: Australia and the Pacific islands*. Blackwell Publishing, Oxford, pp 116–133
- Clarke A, Frederick U (2008) The mark of marvellous ideas: Groote Eylandt rock art and the performance of cross-cultural ideas. In: Veth P, Sutton P, Neale M (eds) *Strangers on the shore: early coastal contacts in Australia*. National Museum of Australia, Canberra, pp 148–164
- Clarke A, Frederick U (2011) Making a sea change: rock art, archaeology and the enduring legacy of Frederick McCarthy's research on Groote Eylandt. In: Thomas M, Neale M (eds) *Exploring the legacy of the 1948 American-Australian scientific expedition to Arnhem Land*. ANU e-press, Canberra, pp 135–155
- Cole K (1980) *Seafarers of the Groote archipelago: Aborigines and mariners of the islands off Eastern Arnhem Land*. Keith Cole Publications, Bendigo
- Faulkner P (2006) *The ebb and flow: an archaeological investigation of late Holocene economic variability on the coastal margin of Blue Mud Bay, Northeast Australia*. Unpublished PhD dissertation, Australian National University, Canberra
- Flinders M (1814) *A voyage to Terra Australis*, vol II. G. and W. Nicol, London
- Frederick U (1997) *Drawing in differences: changing social contexts of rock art production in Watarrka (Kings Canyon) National Park, Central Australia*. Unpublished PhD thesis, Australian National University, Canberra
- Frederick U (1999) At the centre of it all: constructing contact through the rock art of Watarrka National Park, central Australia. *Archaeol Ocean* 34(3):132–144
- Gibbs M (2006) Cultural site formations in maritime archaeology: disaster, response, salvage and Muckleroy 30 years on. *Int J Naut Archaeol* 35(1):4–19
- King PP (1827) *Narrative of a survey of the intertropical and western coasts of Australia performed between the years 1818 and 1822* (2 vols). John Murray, London
- Kingsley S (1997) The Utica Harbour ship *graffito* reviewed. *Int J Naut Archaeol* 26(1):58–64
- Lamilami L (1974) *Lamilami speaks: the cry went up. A story of the people of Goulburn Islands, North Australia*. Ure Smith, Sydney
- Langdon MK, Van de Moortel A (1997) Newly discovered greek boat engravings from Attica. In: Litwin J (ed) *Down the river to the sea: proceedings of the eight international symposium on boat and ship archaeology*. Polish Maritime Museum, Gdansk, pp 85–89
- Layton R (1992) *Australian rock art: a new synthesis*. Cambridge University Press, Cambridge
- Maarleveld TJ (1995) Type or technique. *Int J Naut Archaeol* 24(1):3–7
- Macgillivray J (1852) *Narrative of the Voyage of H.M.S. Rattlesnake, Commanded By the Late Captain Owen Stanley, R.N., F.R.S. Etc. During the Years 1846–1850*, vol 2. T. & W. Boone, London
- Macknight C (1976) *The voyage to Marege Macassan trepangers in Northern Australia*. University Press, Melbourne
- MacKnight CC (2008) Harvesting the memory: open beaches in Makassar and Arnhem Land. In: Veth P, Sutton P, Neale M (eds) *Strangers on the shore: early coastal contacts in Australia*. National Museum of Australia, Canberra, pp 133–147
- Martin LR (2001) *The art and archaeology of Venetian ships and boats*. Texas A&M University Press, College Station
- May SK, McKinnon JF, Raupp JT (2009) *Boats on Bark: an Analysis of Groote Eylandt Aboriginal Bark-Paintings featuring Macassan Praus from the 1948 Arnhem Land Expedition, Northern Territory, Australia*. *Int J Naut Archaeol* 38(2):369–385
- May SK, Taçon PSC, Guse D, Travers M (2010) Painting history: indigenous observations and depictions of the 'other' in northwestern Arnhem Land, Australia. *Aust Archaeol* 70:29–37
- May SK, Taçon PSC, Pearson M (2011) Painted ships on a painted landscape. Paper presented at the 2011 ICOMOS Watermarks conference, Melbourne, Victoria, 29 Oct 2011
- McGrail S, Anthony F (1979) Rowing: aspects of the ethnographic and iconographic evidence. *Int J Naut Archaeol* 8(2):155–166
- Mitchell S (1994) *Culture contact and indigenous economies on the Coburg Peninsula, northwestern Arnhem Land*. Unpublished PhD thesis, Northern Territory University, Darwin



- Morphy H (1991) *Ancestral connections: art and an Aboriginal system of knowledge*. University of Chicago Press, Chicago
- Mott LV (1990) Medieval ship graffiti in the Palau Reial at Barcelona. *Mar Mirror* 76(1):13–21
- Mott LV (1994) A three-masted ship depiction from 1409. *Int J Naut Archaeol* 23(1):39–40
- Mulvaney J (2004) Paddy Cahill of Oenpelli. Aboriginal Studies Press, Canberra
- Mulvaney J, Green N (1992) *Commandant of solitude: the journals of Captain Collet Barker 1829–1831*. Melbourne University Press, Melbourne
- O'Connor S, Arrow S (2008) Boat images in the rock art of northern Australia with particular reference to the Kimberley, Western Australia. In: Clark G, Leach F, O'Connor S (eds) *Islands of inquiry: colonisation, seafaring and the archaeology of maritime landscapes*. ANU ePress, Canberra, pp 397–409
- Palmer M, Neaverson P (1998) *Industrial archaeology: principles and practice*. Routledge, London
- Powell A (1982) *Far country: a short history of the Northern Territory*. Melbourne University Press, Melbourne
- Pritchard V (1987) Some English medieval ship graffiti. *Mar Mirror* 73:318–320
- Roberts D (2004) Nautical themes in the Aboriginal rock paintings of Mount Borradaile, western Arnhem Land. *Great Circ* 26(1):19–50
- Schiffer MB (1987) *Formation of the archaeological record*. University of New Mexico Press, Albuquerque
- Searcy A (1907) *In Australian tropics*. Kegan Paul, Trench, Tumbner and Company, London
- Skibo JM, Schiffer MB (2008) *People and things: a behavioural approach to material culture*. Springer, New York
- Taçon PSC, May SK, Fallon SJ, Travers ME, Wesley D, Lamilami R (2010) A minimum age for early depictions of southeast Asian praus in the rock art of Arnhem Land, Northern Territory. *Aust Archaeol* 71:1–10
- Thomson DF (1949) *Economic structure and the ceremonial exchange cycle in Arnhem Land*. Macmillan, Melbourne
- Turner DH (1973) The rock art of Bickerton Island in comparative perspective. *Oceania* 43(4):286–325
- Turner GSR (2007) Bahamian ship graffiti. Unpublished MA thesis, Texas A&M University, College Station
- Veth P, Sutton P, Neale M (eds) (2008) *Strangers on the shore: early coastal contacts in Australia*. National Museum of Australia Press, Canberra
- Warner WL (1937) Malay influence on the Aboriginal cultures of north-eastern Arnhem Land. *Oceania* 2:47–495

KEYWORDS: *Rock art – Arnhem Land – Contact – Firearms – Northern Territory*

## FIREARMS IN ROCK ART OF ARNHEM LAND, NORTHERN TERRITORY, AUSTRALIA

Daryl Wesley

**Abstract.** Firearms form part of Historic period rock art in the Northern Territory, Australia, and have been discussed in terms of initial and ongoing culture-contact between settler societies and Indigenous communities. Drawing on fourteen firearm paintings from eight archaeological sites in Arnhem Land, and a review of the historic literature, this study suggests that Indigenous communities experienced firearms in a variety of ways, progressing from early conflict through to ownership during the buffalo shooting industry. Firearm paintings demonstrate the influence on Indigenous society arising from the introduction of a powerful technological innovation. Firearms influenced Indigenous social organisation and became incorporated into the traditional belief system. Finally, firearm paintings reveal Indigenous perceptions of introduced technology and can inform on changes in settlement and mobility. This paper advocates the model of 'ownership equals painting' rather than simply painting what has been seen from afar as argued for depictions of maritime rock art.

### Introduction

Western Arnhem Land (Fig. 1) has a very prolific assortment of rock art, amongst which there are an array of various 'contact motifs' consisting of introduced imagery arising from interactions by Aboriginal people of Arnhem Land with Macassans and Europeans. Firearms in the rock art of Arnhem Land are reported in detail in only a few references (e.g. Brandl 1982; Chaloupka 1993; Edwards 1979; Jelinek 1989; Lewis 1988; Roberts and Parker 2003). Chaloupka (1993) provides the most detailed account of firearm paintings in his discussion on contact period rock art. Others refer briefly to firearms as part of the historic phase of rock art painting and discuss them in terms of initial culture contact and interest from Indigenous painters. In contrast, this paper investigates the presence of firearms in rock art in relation to changes occurring in Indigenous society during the historic contact period in the Northern Territory.

Indigenous communities experienced firearms in a variety of ways, progressing from early conflict (early to mid-1800s) to ownership during the buffalo industry (late 1800s to 1940s) (Warburton 2009). Firearms are documented in rock art elsewhere internationally where settler culture's encountered indigenous societies (Ouzman 2005; Yates et al. 1993), but only in Arnhem Land do they appear to be fully integrated into the traditional painting manner (Chaloupka 1993: 196).

A special value of contact-era rock art, during times

of confrontation, land seizure, population displacement, new diseases and population collapse — as was the case following the Europeans incursions into northern Australia — is that it gives some insight into this frontier as experienced from the Indigenous perspective. Historic sources and their accompanying illustrations are by definition the European viewpoint, and rarely attempt to convey the Indigenous experience.

While our cultural understanding of what constitutes a gun or ship allows us to recognise the object, and possibly privileges meaning of the painting, research into introduced subject matter (i.e. ships, cattle, horses etc.) in Indigenous art needs to take into account the traditional belief systems and practices of local groups. Porr and Bell (2012) challenge the primacy of Western scientific and literary academic methodologies in the study of Aboriginal rock art. They state that Indigenous ways of knowing need to be utilised in critical evaluation in rock art studies (Porr and Bell 2012: 15). Contact period rock art needs to be approached with an equal partnership of Western science and Indigenous knowledge in the interpretation of Indigenous people and their environment (Porr and Bell 2012: 40). Thus research on representations of firearms in Arnhem Land rock art provides an avenue to explore the dynamics between Indigenous society and introduced cultures (i.e. by Europeans). As discussed below, the ability of rock art to inform on the negotiation of cross-cultural space has received significant attention in recent years

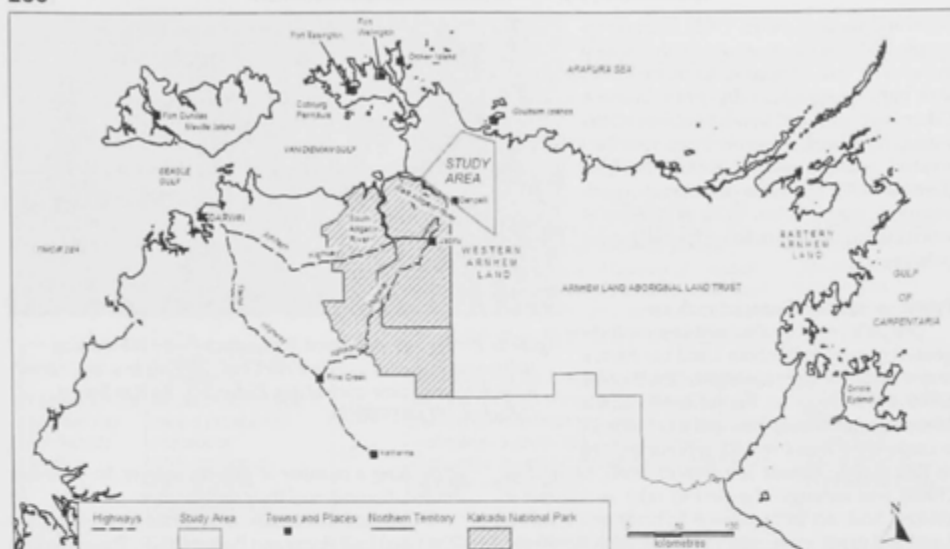


Figure 1. Location of the study area, Northern Territory, Australia.

(Clarke 2000a, 2000b; Frederick 2000; McNiven and Russell 2002; Torrence and Clarke 2000). Therefore, this paper not only records Indigenous familiarity with firearms, it attempts to go beyond simple presence and absence, to explore the impact of the technology and knowledge transfers into Indigenous cultures. The distribution of these motifs in different areas of Arnhem Land may also inform on changes in settlement, mobility and social organisation following European contact in the early 1800s.

#### Firearms and colonial contact rock art

According to McNiven and Russell (2002) contact archaeology has become part of the post-colonial discourse and such research should be aimed at understanding the dynamics of inter-cultural encounters rather than just missing histories. One such issue is the problematic nature of 'contact' rock art which is usually defined by the presence of specific contact motifs. Clarke (2000a; 2000b) proposes that it is not only a site of contact but also a context for mediating cross-cultural exchange through the making of pictures that record this exchange and interaction. On Groote Eylandt, Clarke and Frederick (2011: 142-143) investigated the ways in which Indigenous artists chose to represent their interactions with outsiders and argued that the differences in the depictions of Macassan and European subjects showed a different social dynamic and familiarity in the experience of contact. Similarly firearms in Arnhem Land rock art can provide a unique window into Indigenous experience during the various phases of contact.

What were firearms used for? Until recently the story

told and pictured in popular histories of the Northern Territory was one of conflict between European settlers and Indigenous people. For example, a typical frontier encounter is depicted in the illustration by E. Jacko on the cover of Pike's *Frontier territory* (1972) showing a white man on his rearing horse waving a Colt pistol, while the Aboriginal warrior below wields a barbed spear. That there were some such confrontations is reliably documented, although the frequency and severity of such engagements in western Arnhem Land is now disputed (Reynolds 2006). The scene drawn by Jacko has more of the air of fantasy history in the tradition of the American Western than of reality in the wetlands of the Top End. The more likely everyday experience of firearms, for both European and Indigenous Australians, was their mundane use for hunting. Birds and the smaller animals, like goannas and wallabies, were hunted with shotguns or small-calibre rifles, while a photograph from 1916 of two Arnhem Land hunters shows them using a small bore rifle and shotgun in a 'traditional' manner to carry their catch of fish (Fig. 2). The larger introduced animals — cattle, pigs, horses, donkeys, and above all the formidable water-buffalo, introduced from south-east Asia into Arnhem Land by the British settlers in the 1840s (Powell 1988), required the larger calibre rifles, typically ones also used by armies in combat. Thus in the early phase of European contact, the usefulness of firearms for hunting far outweighed their use in incidents of frontier fighting as depicted by Pike (1972).

We also know that following this initial phase of contact from approximately 1880 to the mid-1930s, there was a large industry in hunting feral buffalo for their

hides and horns (Levitus 1995). Indigenous people had two kinds of roles in the buffalo industry. A few, all men as far as we know, shot buffalo, alongside the white hunters. Others, both men and women, finished off the wounded animals, skinned them, and then washed, salted, cured and stacked the hides (Levitus 1995). The value of firearms in such economic pursuits has to be remembered when exploring their meaning for Indigenous painters.

### Previous studies of contact rock art

The influence of other cultures on Indigenous groups in Arnhem Land has been a major theme for anthropologists. The Berndts wrote extensively on the influence of the Macassans and Europeans and this has been a continuing trend in Indigenous studies in this region (Berndt and Berndt 1954). Mountford (1956) was amongst the first to take an interest in contact rock art from Groote Eylandt and Arnhem Land and to recognise regional variation in the themes depicted. He noted that the imagery on Groote Eylandt is largely about Macassans and the trepang harvesting industry (Mountford 1956: 99; Clarke and Frederick 2011), whereas in western Arnhem Land, he recorded a European ship and a building which he was told by his Aboriginal informants were images seen in Darwin (Mountford 1956: 159). Images of firearms are recorded in later studies, such as the famous depiction of a person holding a firearm above his head from Deaf Adder Gorge in Brandl (1982: 18). Later, Lewis (1988: 413) illustrated a Martini-Henry rifle which he assigned to his long spearthrower period along with other figurative images of European objects in order to recognise them as one aspect of the continuous Indigenous painting tradition, rather than assign introduced imagery to a separate 'contact' category.

Chaloupka (1993: 191) considers the 1920s as the period when rock art production in the northern and western Arnhem Land escarpments declined. The chronology of rifles in the rock art tends to reflect this pattern, although painting occurred up to the 1950s in some other areas, for example at the Djulirri rockshelter in the Wellington Range (May et al. 2010; Taçon et al. 2010; Wesley et al. 2012). Chaloupka (1993: 198-201) observes that the buffalo shooting industry had a major influence on Indigenous society in Arnhem Land. Introduced stock and domestic animals such as horses, cattle, pigs, goats and cats were given language names and are also featured in the rock art (Chaloupka 1993: 201). He reproduces at least three images of Martini-Henry rifles, with two other firearm motifs likely to pre-date the 1850s (Chaloupka 1993: 194-197). Chaloupka (1993: 194) suggests that these early depictions of firearms reflect an understanding of their use as a weapon as they are painted in the same fashion as a spear being held by a person. Although



**Figure 2.** Photograph by Edward Reichenbach from 1916 showing Indigenous hunters using their rifles and shotguns in a 'traditional' manner to carry their catch of fish. PictureNT, Karilynn Brown Collection (PH0413/0018).

illustrating a number of firearm images, he provides limited discussion of their significance.

Three further images of firearms in rock art are illustrated by Roberts and Parker (2003). They note that the majority of firearms depicted in the Mt Borradaile area are of Martini-Henry rifles and some are likely to be muzzle loading percussion-cap pistols (Roberts and Parker 2003: 42). They also attribute the presence of firearms in the rock art of the region largely to a discourse of European conquest and frontier conflict, although there is acknowledgement that Indigenous experience of firearms would have occurred as a result of their employment in the buffalo industry (Roberts and Parker 2003: 43).

Colonial contact rock art imagery has been recorded elsewhere in the world in North America and South Africa (e.g. Ouzman 2005; Yates et al. 1993). Yates et al. (1993) describe colonial contact imagery of horses, mules, other introduced animals, wagons, Europeans and ships from South African rock art sites. In contrast with the artistic continuity exhibited in the portrayal of European objects in the rock art of Arnhem Land, they describe the majority of colonial contact-period rock art in the south-west of South Africa as 'crudely rendered' (Yates et al. 1993: 67). The authors also discuss the paintings as an important source of information regarding resistance and social identity, the underlying belief system, ritual and artistic practices of the indigenous artists (Yates et al. 1993: 68).

### Rifle technologies as a chronological indicator

Early encounters with firearms may have occurred as a result of contact with Macassan trepang mariners. Although the date of the first forays by Macassans is uncertain, there is considerable evidence that Macassans were processing trepang in Arnhem Land by the start of the 18th century, visited repeatedly until 1906 and were known to carry musket-type firearms (Clarke 1994, 2000a, 2000b; Flinders 1814: 290; Macknight 1969, 1986; Mitchell 1994; Taçon et al. 2010). These

Technology	Firearm types and manufacturers	Timing	Innovation and characteristics	References
Flintlock	New Land pattern musket; Short New Land Pattern musket	1795	Muzzle loading musket has a smooth bore inside the gun barrel and fires a lead ball projectile. Cock with flint, priming pan, pan cover (frizzen). Trigger guard, sling swivels, bayonet mounts, long barrel, a brass butt plate, and a general long narrow shape.	1800 to 1870 (Halls 1974; Skennerton 1975)
Percussion-cap	Previous muskets; pattern 1848 percussion musket; pattern 1853 Enfield; general variety of manufacturers and types	1840s 1848 1853	Existing muskets fitted with percussion-cap. Muzzle loading smooth and rifled bore. The percussion cap allowed more widespread use of rifling in the barrel instead of a smooth bore, improved accuracy. Firearms have same characteristics as flintlocks, general long narrow shape and retain hammer-and-percussion.	1848 Percussion-cap rifle (Duckers 2005; Halls 1974; Skennerton 1975)
English centre fire and rim fire breech loading	Snider Enfield .577 conversion; Martini-Henry rifle with a number of variations; wide variety of sporting rifle manufacturers	1866 1871	New firearms invented. Many conversions of existing firearms with flipping block. Breech-loading mechanisms and new bullet cartridge technology introduced. Martini-Henry has distinctive 'humped' breech and loading lever beneath wrist of stock	1870s U.K. (Halls 1974; Pauly 2004; Lugs 1973; Skennerton 1975; Westwood 2005)
American centre fire and rim fire breech loading	Sharps; Springfield; Winchester	1869 1868 1873	Breech loading, falling and lifting block, and lever action reloading. Distinctive features i.e. 'tang sight', different styles of stocks, fore-stocks, and levers	1870s U.S.A. (Lugs 1973; Pauly 2004)
Modern bolt action centre fire repeating rifles	.22 calibre rifles; .303 Lee-Enfield; Mauser	1880s 1888 1870s	New propellants, increased muzzle velocity, rifles with smaller calibres and longer range. Small calibre inexpensive. Bolt action predominant.	1900s (Lugs 1973; Halls 1974; Skennerton 1975; NTIG <sup>1</sup> )

<sup>1</sup>Northern Territory Times and Gazette

**Table 1.** Technological innovations in firearms in the 19th century and major types of weapons in relation to the Northern Territory history. (See Fig. 3 for illustrations.)

firearms are rarely reported in accounts of Macassan trade, therefore this paper will concentrate on the depictions of 19th century firearms, and particularly rifles. Rifles underwent a rapid change in design and technology which enables individual firearms to be used as approximate chronological markers. The 1800s started with muzzle-loading muskets that could fire a maximum of four rounds per minute, and ended with the Lee Enfield .303 capable of firing up to 30 rounds per minute (Hall 1916: 27). It is important to note that transfer and adoption of new technologies in Western society was not a uniform standardised process in the 19th century. For example, the breech-loader, where ammunition was loaded from the rear of the rifle and not the muzzle, was invented early in the 1840s, yet it took some 30 years to become widespread in circulation. This point is important when constructing chronologies around firearms' innovation and use (Table 1). In other cases, commercial success and popularity became the driving force for the uptake of new rifles (Pauly 2004: 110).

In Australia, 19th century firearms began with the muzzle-loading flint-lock muskets issued to the British infantry and marine garrisons (Fig. 3). This is a slow firing weapon, requiring skill and training to master;

it was susceptible to weather and environmental conditions. Percussion caps replaced flints as the main ignition system in the early 1800s (e.g. the Pattern 1848 percussion musket). By the 1850s the British introduced a variety of percussion rifles into widespread service (Duckers 2005: 15). These two types of firearms, the musket and rifle with flintlock and percussion-cap actions, have very similar appearance characteristics and are very difficult to distinguish apart from a distance (see Fig. 3). This similarity makes it hard to distinguish these two musket types in rock art. Therefore these musket technologies are grouped together as firearms of the 1820 to 1870 period.

It is during this period that the earliest documented European encounters with Aboriginal people and firearms occur. The earliest report was at Goulburn Island. Captain Phillip Parker King (1827: 69) stopped at Goulburn Island, off the coast of north-west Arnhem Land in 1818 and ordered his shore party to fire at Aboriginal men who stole tools (Fig. 4). Later Indigenous encounters with musket firearms occurred at the English outposts of Fort Dundas, Melville Island (1824 to 1829); Fort Wellington, Cobourg Peninsula (1827-1829); and Victoria Settlement, otherwise known as Port Essington (1839-1849) (Fig. 1) (Allen 1969,



1972; Powell 1988). Generally firearms are referred to in accounts from these settlements simply as muskets, flintlocks, guns and pistols (Mulvaney and Green 1992: 54; Wilson 1837: 137, 141). Archaeological investigations by Allen found both expended flints and percussion-caps, and thus reflecting an important change in musketry that was taking place during the time that Port Essington was occupied (Connah 1988: 47).

The development of the bullet cartridge centre-fire and rim-fire rifles gathered pace in the 1870s (Pauly 2004: 96). In the late 1870s to 1880s there was a myriad of rifle action designs in production (Lugs 1973). It was a time of major invention and diversity until 1900 when most firearms manufacturers chose the horizontal breech loading design which in turn allowed for unique characteristics to be displayed when depicted in rock art paintings (Lugs 1973: 83-84). The introduction of bullet cartridges quickly made the muzzle-loading weapons obsolete and they were rapidly discarded as shooters much preferred the new superior technology, especially in frontier conflict situations. The Snider-Enfield was one of the many rifles that saw extensive use in the Northern Territory during its early occupation and development after 1869, as mining, agricultural and pastoral developments took hold (Bauer 1964; Goon 1995; Powell 1988). Early forays by prospectors and punitive expeditions into western Arnhem Land were noted to have been armed with the Snider Enfield rifles (NTTG 1875: 2, 1898: 3).

The Martini-Henry rifle was adopted by the British Army and entered service in June 1871 (Westwood 2005: 61) (Fig. 3). It is a single-shot weapon, rifled barrel, lever-action, with a falling breech-block and a .45 calibre bullet cartridge (Pauly 2004: 109). Martini-Henry carbines were to become the favoured weapons for horsemen in the cattle and buffalo industries in the Northern Territory as the powerful cartridges gave a long range, with a flat trajectory (Mulvaney 2004; Pauly 2004: 109). Evidence from reviewing buffalo shooter accounts suggests this was the most common type of rifle used between 1870 and 1900 on the north Australian frontier (NTTG 1873-1927; Warburton 2009). The incorporation of Indigenous labour by white buffalo shooters into the industry during the 1890s was widely reported, and it was during this time that rifles began to be used or owned in significant numbers by Indigenous



Figure 3. Examples of the firearms and their features from the different time periods identified in the paper.



Figure 4. View from Goulburn Island as Phillip Parker King's watering party is attacked by 'natives' in 1818 (nla.pic-an7851134).

Era	Group	Activities	Weapon types
Pre 1800	Macassans	Trepan fishing and trade with local Indigenous populations	Chinese/S.E. Asian muskets
1820 to 1870	Early colonial military outposts	Establishment of small garrisons to secure Australia's north and trade with Macassans. High representation of military personnel. Some exploration expeditions to the NT.	Brown Bess musket Indian Pattern musket Percussion-cap musket Snider-Enfield
1870 to 1920	Settlers, miners, pastoral settlers, buffalo shooters	Mixture of pastoralism, mining and natural resource extraction (buffalo shooting for hide export). Very low representation of military presence.	Snider-Enfield Martini-Henry Winchester Sharps rifle Henry rifle Break open shot guns Small bore .22 rifles
1920 onwards	Recreational shooters, Military, pastoral industry, buffalo shooters, missions	Large and small game hunting; pastoralism is entrenched as major industry; mining sporadic; beginning of missions; buffalo hide export declines by 1930s with introduction modern durable fabrics 1930s military build-up in Darwin and WWII large presence of military units	Lee Enfield .303 SMLE, Mauser pattern 7.69 mm, Winchester lever action, shot guns (various), small bore .22 rifles

**Table 2.** Historical economic periods with respective firearm types in the Northern Territory

people (Forrest 1985: 6-7; Mulvaney 2004: 13; Warburton 2009: 177); however, this was not entirely supported within the Northern Territory community at the time (Gilruth 1923: 4; O'Neil et al. 1910: 4).

Firearms made in the United States also appear in northern Australia, however, these rifles are rarer than British-made firearms owing to their greater cost and import tariffs. Despite this, US-manufactured repeating rifles began to make their way into the buffalo shooting camps of the Northern Territory in the late 19th century (Mulvaney 2004). The most successful of these rifles in Australia was the lever action 1873 manufactured by the Winchester Company (Pauly 2004: 110). These rifles did not have widespread use in the pastoral and buffalo shooting industries until the early 20th century, after Federation and subsequent changes in the Australian tariff and import regulations (Warburton 2009). Therefore, this group of firearms is assigned to the post-1900 era in the Northern Territory when they were likely to have been seen in greater numbers.

The development of bolt-action centre-fire rifles (firing pin) and the smokeless cordite propellant in the late 19th century saw the next major change in firearms technology (Lugs 1973). The English-made Lee-Enfield .303, used a bolt action and included the innovation of a detachable magazine (Fig. 3). Repeating rifles are most likely to have been used increasingly in the Northern Territory post-1900. Nevertheless, Indigenous access to rifles significantly declined after 1925 following the entrenchment of mission governance in western Arnhem Land, the decline in buffalo shooting, and the growing reach of government authority from Darwin with ordinances banning Indigenous men from owning firearms.

#### The distribution and chronology of firearm paintings recorded in this study

The author has recorded fourteen images of firearms in eight separate rockshelters across western Arnhem Land located near the northern coastline and deep into the Arnhem Land plateau stone country (Table 3, Fig. 5). The firearms consist of seven Martini-Henry rifles, two muskets, and two Winchester carbines. The remaining motifs are more difficult to identify and are possibly a Lee Enfield SMLE rifle or Winchester carbine, a Snider-Enfield carbine or shotgun, and a pistol of unknown technology. The Kundjumarndi firearm has been previously reported by Gunn (1988) and the site was re-recorded by the author in 2008. The pistol has been reported here as examples are very rare in the western Arnhem Land rock art assemblage. However, it is not discussed further owing to the lack of identifying characteristics. The manner in which the firearms are painted is consistent with the styles and traditions previously documented in the Arnhem Land region (Chaloupka 1993).

Figure 6 provides a summary of the rock art painting manner and pigment used in the firearm images. The use of white pigment in the majority of paintings accords with previous assessments of white pigment use during the contact period owing to diminishing access to traditional sources of red pigments (Chaloupka 1993). The white and blue pigment Martini-Henry painting is located at Mount Borradaile. Blue pigment is suggested to have been derived from Reckitts Blue, a laundry whitener (Chaloupka 1993). The use of Reckitts Blue for Indigenous painting is first reported by Spencer (1928: 831) occurring in the Alligator Rivers region by 1912. Chaloupka (1993) suggests that the blue pigment

Site	Firearm type	Motif description	Identifying features	Interpretation
Kundjumarndi	Martini-Henry	Red outline and infill on white; life size	Lever action; scalloped breech; trigger guard; general shape	Likely to be a representation of a Martini-Henry with 'humped' breech loading area with a trigger guard and loading lever.
Awunbarna	Martini-Henry	White with blue infill and outline; small	Scalloped breech; trigger guard; general shape; barrel; stock; butt stock	A cut-down rifle or carbine; i.e. with much of the length of the stock and barrel removed. 'Humps' on the breech and the lack of any visible firing mechanism could indicate that the basis of this weapon was a Martini-Henry.
Arrarra	Musket, New Land pattern	Red outline and infill on white background; life size	Cock and hammer; ramrod prominent; no breech; long barrel; butt plate	The cock is drawn without any upright thumb-piece to actually cock the arm. However, a flintlock with the cock and the frizzen both lowered would look something like the painted image. Two apparent trigger guards likely to be hand-steadying loop and lanyard attachment.
Arrarra	Martini-Henry	Red outline and infill on yellow; life size	Scalloped breech, lever action, sling, trigger guard, accentuated curve shape, butt plate	Configuration of the breech is very distinctive, having 'humps' on the top of the receiver before and behind the falling-block loading trap. Apparent thickness of the barrel as portrayed is probably due to it having the standard military wooden fore-end that extends almost to the end of the barrel.
Djarrng	Winchester repeating rifle	Superimposed over another firearm. Red outline with solid yellow infill; life size	Lever action; butt plate; trigger guard; rear sight; tang sight	Not likely to be a Martini-Henry as the receiver seems too short and the under-lever an odd shape. Most likely 19th century Winchester lever-action repeater carbine configuration. A tang sight could be fitted to this by screwing the sight to the upper butt strap (or tang) a couple of inches behind the hammer. The tang sight was used for target shooting and for long-range work typical of buffalo shooting.
Djarrng	Martini-Henry	Firearm image under another firearm painting. Outline with line infill; life size	Lever action; butt plate; scalloped breech area	Likely to be a representation of a Martini-Henry with 'humped' breech loading area.
Djarrng	Snider-Enfield carbine or shotgun	Solid white background with red outline and infill; life size	Short barrel and forestock, hammer, long butt, lever	The fairly straight stock, the very compact breech area, with an apparent hammer shown above, and the long slim barrel suggest that this could be a Snider Enfield carbine or possibly a shotgun.
Djurlirri	Firearm (musket?)	Outline; white; life size	Trigger, trigger guard, long barrel, possible bayonet(?)	The butt in the painting has been weathered, leaving only a thick barrel, a disproportionately large trigger guard and trigger, and a featureless breech area, with an extension under the barrel that may represent a bayonet, or bayonet lug.
Djurlirri	Winchester or Lee Enfield SMLE .303	Drawing; charcoal; small	Hammer or Bolt, Fore stock, sling, straight butt, squared off barrel, trigger guard and lever or possible trigger guard and square ammunition box	It appears to show a hammer, an under-lever behind the trigger guard and a rather thick fore-end. It does not differentiate the under-barrel tube magazine extending beyond the fore-end wood, possibly a carbine model. Could also be argued that painting is a 'sporterised' Lee Enfield .303 British rifle, i.e. a .303 that has had the fore-end wood cut to about half its length, leaving the forward part of the barrel protruding. The squarish forward 'trigger guard' could be seen as representing the protruding box magazine.
Mekirj Valley	Winchester carbine	Outline with infill; white outline with yellow infill; life size	Hammer, forestock, long barrel, trigger and guard	Hint of a loading under-lever behind the trigger guard, but without the distinctive breech shape it seems unlikely to be a Martini. As there appears to be a hammer depicted above the breech, the most likely identification is that it is a Winchester carbine.
Warran	Martini-Henry	Outline and infill; white; life size	Lever action, trigger guard, scalloped breech and butt, very long barrel	Long rifle appears to have an under-lever but without the distinctive breech of a Martini.
Warran	Martini-Henry	Solid; white; partially visible; life size	Butt, lever action, scalloped breech area	Diagnostic for the arm; the 'double humped' breech, the under-lever for loading and the stock shape is reasonably accurate for this rifle.
Malarrak	Martini-Henry	X-ray form; white background with red outline and infill; life size	Lever action, trigger guard, scalloped breech and butt, cartridge depicted inside chamber, barrel and cleaning rod, foresight	Diagnostic for the 'double humped' breech and trigger guard with loading lever. Stock shape is reasonably accurate for this rifle. Appears like standard military wooden fore-end that extends almost to the end of the barrel in this painting. The fore-end also served to house a steel clearing rod.
Malarrak	Pistol	Solid; white; small	Short barrel, pistol type grip	Possibly a pistol/revolver. Very limited detail in order to identify type and manufacturer.

Table 3. Firearm images recorded western Arnhem Land.



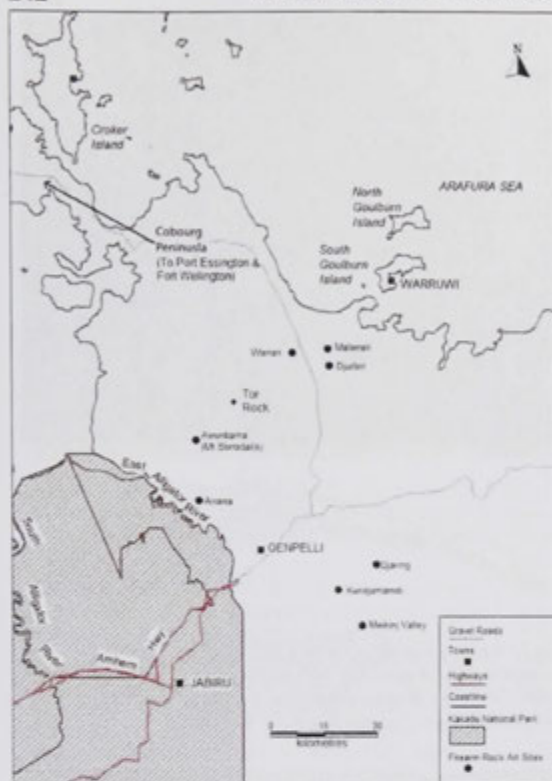


Figure 5. Location of rock art sites featuring firearm paintings and drawings.

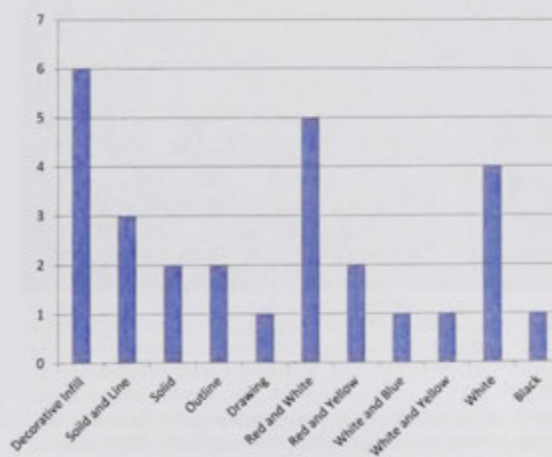


Figure 6. Summary of painting manner and pigments used in firearm paintings.

finds widespread use after the introduction of Reckitts Blue by Oenpelli missionaries in 1925.

The rifle motifs are all located in rockshelters with greater than 50 motifs. According to Gunn's (1988) definition of rock art sites, Djulirri, Awunbarna, Minkin Valley, Kudjumarndi and Djarrng can be considered to be major rock art galleries with >100 paintings within the Arnhem Land complex. Djulirri has the highest number with over 1500 recorded motifs (May et al. 2010). The Arrarra, Warran and Malarrak rockshelters contain fewer paintings and are considered as minor rock art galleries (Gunn 1988). Djulirri, Malarrak, Minkin Valley and Awunbarna sites all contain other types of introduced contact imagery including paddle steamers, steamships, luggers, European structures, eating implements, letters of the alphabet, generic sailing vessels, buffalo and European anthropomorphic figures. Djulirri has the most extensive and diverse introduced contact imagery in western Arnhem Land (May et al. 2010). Contact period occupation is evident in all the sites containing firearm images, in the form of glass flakes, glass shards and fragments of corroded metals. Djulirri, Malarrak and Awunbarna contained further contact artefacts including fragments of smoking pipes, ceramic shards, glass beads, nails and wire. Other artefacts noted elsewhere in the greater Awunbarna complex of rockshelters include a matchbox tin, an iron adze, domino piece, tobacco pipe, bag of shot, and hand-forged nails and screws (Roberts and Parker 2003: 26). The diversity and abundance of the contact artefact assemblages at these three sites suggests they were focal points for occupation during this period.

Metrical attributes are not available for all the firearms as the sites were recorded as part of a summary site documentation process. However, the majority of the rifles (11) are depicted in life-size proportions. With the exception of Djulirri and Arrarra, the rifle paintings are all positioned prominently on a central large panel in each of the rockshelters. At Arrarra, the musket is obscured by a large boulder in front of the panel, and the Martini-Henry rifle is on the ceiling in another part of the site. The firearms at Djulirri are not prominently displayed. The Lee Enfield motif is small and placed at the base of a large panel, and the white outline musket is partially obscured by superimposition of later motifs.

There are two firearm motifs that exem-

plify the high level of detail depicted by the artist. The first, painted in the Arrarra complex of rock art sites approximately 20 km north of Oenpelli, is notable for a number of features which identify it firmly as a musket (Fig. 7):

1. 'Cock and hammer' above the trigger guard.
2. A sling swivel behind the trigger guard.
3. A distinctive ramrod holder mounted below the gun barrel.
4. The shoulder pad of the butt.
5. The use of decorative infill to distinguish the brass butt plate as separate to the gun barrel, i.e. made of wood and not iron.

The second, a rifle at Malarrak (Fig. 8), is a Martini-Henry showing the breech mechanism in great detail. The 'monkey tail' lever action and trigger housing can be clearly seen below the rifle, with the distinctive falling breech, block loading area on the top of the rifle. The breech is painted in x-ray style showing a bullet loaded into the firing chamber.

The Djarrng rockshelter potentially has three different types of firearms depicted. These include a Martini-Henry rifle, but interestingly also two other firearms that have significantly different characteristics. One firearm has an unusual rear sight known as a 'tang sight' developed for buffalo shooting in the United States from the 1870s (Fig. 3) (Lugs 1973). The other is a short rifle depicting a type of carbine with a hammer typical of the Snider Enfield (Fig. 9).

These examples illustrate the attention to detail by the artists in showing individual firearm characteristics. This is typical of what may be regarded as a continuous observational tradition in Indigenous art in Arnhem Land from the earliest images through to the contact period, which Chaloupka (1993: 181) identifies as 'scientific' illustration. Some of the firearms also incorporate elements of complex decorative infill and x-ray styles that were in common use at the time of contact (Chaloupka 1993: 191-203).

## Discussion

### *Pre-1800s to 1840s early contact phase*

Indigenous use of firearms in the early contact phase is likely to be limited. Muzzle loading weapons were generally inaccurate beyond 100 m (Lugs 1973).



Figure 7. A percussion-cap or flintlock style of firearm at Arrarra painted with decorative infill, with red on white pigments (D. Wesley 2006). Below is a drawing illustrating the hammer mechanism, ramrod under the barrel, trigger guard and sling swivel.



Figure 8. A Martini-Henry rifle from Malarrak painted in outline and x-ray, with red on white pigments (D. Wesley 2008). Below is an illustration showing the lever action, trigger housing, breech area, and a bullet in the chamber. Note the freshwater buffalo painting to the right.





**Figure 9.** Carbine type of rifle at Djarrng painted in outline then solid and decorative infill, red on white pigments. A distinctive hammer mechanism is seen above the trigger guard and breech (D. Wesley 2006).

Muskets would therefore not have been decidedly better weapons than spears and spear throwers already used by the Indigenous people. Muskets could fire four rounds per minute but according to Traditional Owner Jacob Nayinggul (dec.), an Arnhem Land warrior could throw many more spears a similar distance in that time and with similar accuracy (Nayinggul, pers. comm., 2006). Also, muskets did not particularly improve Indigenous hunting techniques owing to unfamiliarity, poor conditions of weaponry, and lack of shot and powder. Even in the mid-20th century, *Maung* hunters were still using spears to hunt water buffalo (Capell and Hinch 1970: 114). During the 19th century it was difficult to resupply lead shot and gunpowder owing to the intermittent supply from visiting Macassans, and the European settlements would have discouraged firearms being taken up as a weapon of choice by a hunting society. Iron muskets are highly susceptible to rust, and the wet-dry tropical climate of Arnhem Land makes it hard even today to maintain iron materials without corrosion.

Contrary to this logic, muskets were well known by Indigenous people at Fort Wellington on the Cobourg Peninsula (Mulvaney and Green 1992; Wilson 1837). Wilson (1837: 319) recorded the local Indigenous language word that had been given for firearms as *ubara*. The English attempted on a number of occasions to demonstrate the usefulness of musketry and cannon in encounters (Wilson 1837: 88, 89, 121, 137). Early Indigenous interactions with firearms were supervised and regulated by English officers and non-commissioned officers, with only the senior Aboriginal male elders present at the early Cobourg Peninsula outposts (Commandant Barker cited in Mulvaney and Green 1992).

It is proposed here that even though these slow-

loading firearms were next to useless in terms of increasing hunting efficiency, they acquired a high level of social capital and status and then become prominent in contact rock art. Chaloupka (1993) interprets certain depictions of firearms in the rock art of Arnhem Land as examples of people encountering firearms for the first time as, for example, those carried by the Leichhardt expedition into Arnhem Land in 1845 (Leichhardt 1847). These are generally painted using traditional design elements, with very limited detail of the weapons' characteristics. However, the complex decorative depiction of such a firearm at Arrarra may suggest this weapon was owned, or at least handled and fired, by Indigenous men. The Arrarra firearm shows five specific characteristics, the hammer and flash pan, ramrod, sling swivel, and trigger guard, whereas the depictions described by Chaloupka (1993) show none of these specific characteristics. I propose that

such a dichotomy arises from possession or use in close proximity to the English settlements on the Cobourg Peninsula. The rock art at Arrarra implies that a close interaction between the Indigenous painter and the weapon has occurred.

As mentioned earlier, Indigenous groups were aware of firearms before Leichhardt arrived in the Alligator Rivers region of Arnhem Land and probably prior to King's visit in 1818 (Leichhardt 1847). Muskets are not depicted in the Wellington Range, yet there are numerous depictions of a single-masted cutter of the type that King was sailing. This presents an interesting contrast in terms of painting firearms and sailing vessels. It is known that painting of early European ships circa 1805 to 1849 occurred in the Wellington Range, however, there are no depictions of firearms that can be reliably dated to this period. Applying the model of 'ownership equals painting' that is advocated in this paper, the lack of firearms paintings from this early colonial period may reflect a lack of ownership and familiarity by the Traditional Owners painting at the time in the Wellington Range.

#### 1870s–1920:

##### *modern European firearms and Arnhem Land rock art*

The Indigenous use and ownership of firearms in this period in the Northern Territory from 1849 to 1870 can be attributed to one overwhelming cause: the Asian water-buffalo hunt. There is a hiatus of firearm painting owing to the absence of substantial European presence in western Arnhem Land with no reliable identified paintings of the percussion rifle technology. It is after 1870 that firearms become more common in the region and vis-a-vis more prominent in the rock art. According to Roberts and Parker (2003: 42) the most

prolific contact period motifs in the Awunbarna area are ships and firearms. They propose that the majority of contact art is from the 1870–1920 period, given the proliferation of images depicting sloops, cutters and ketches that were prevalent off the coast during the buffalo shooting period.

It is during this period that we see one of the first instances of a hybrid European-Indigenous economy occur in the Top End of the Northern Territory (Altman 2007). Altman suggests traditional market and non-market theories are not adequate to fully explain Indigenous interaction with the introduced European economy. Consequently, he proposes a hybrid economy with spatial and temporal flexibility where the Indigenous customary economy and the European market economy combine (Altman 2007). The buffalo-shooting industry is an example of a well-developed hybrid economy between white Australian shooters and Indigenous families. Participation of Indigenous labour in this industry was not only crucial for survival, but also because the industry was transient and seasonal and it allowed matched Indigenous people to maintain traditions and customs (Altman 2007; Levitus 1982).

There are also a number of reports of Europeans encountering Aboriginal men armed with firearms not associated with the buffalo industry. There is no specific record of when or how the first decision was made by a buffalo shooter to give Aboriginal men rifles, but there were certainly buffalo shooters who readily acknowledged the importance of Indigenous labour, and participation in the industry and is well documented pictorially (Fig. 2) (Mulvaney 2004; Warburton 2009).

Warburton (2009: 220) knew the value of Indigenous involvement in buffalo shooting and states 'Big Head [one of the black boys] was an experienced buffalo-shot, and I had given him Dinah [an expert and favoured horse] and a gun'. Europeans also benefitted from the prowess of Indigenous hunters with firearms. An account from the *Northern Territory Times and Gazette* (NTTG Friday, 23 December 1898: 3) states that an Aboriginal man '... will fulfil the order, and as long as you keep him in cartridges and tobacco you need never go short of game'.

It is proposed here that ownership of firearms was a major reason for painting firearms throughout Arnhem Land during this period. The majority of the rifles depicted in the rock art are Martini-Henry rifles, the main weapon known to be in widespread use by Aboriginal men in the buffalo industry. The prominent place that depictions of the Martini-Henry rifles have in the rockshelters and the attention to detail reflect an intimate knowledge of the firearm and a rationale for display.

#### 1920 onwards: decline in firearms ownership

From 1910 onwards, there was a concerted effort to disarm Indigenous people and regulate firearms ownership. Legislation enacted after 1911 prohibited

them from owning firearms without a permit from Protector of Aborigines. The following appears in the *Northern Territory Times and Gazette* (Friday, 28 October 1910: 3):

Iniquity of permitting half civilised Aborigines to wander around the country armed with rifles, and instances at least two murders that have taken place recently from this cause... To place a rifle and cartridges in the hands of a black-fellow... is to convert him into an omnipotent demi-god as respects his unarmed fellows, and it is only to be expected that his savage instinct will lead him sooner or later to abuse such power.

Apart from buffalo shooters actively seeking permits for their Indigenous workers, and illegally lending them firearms for use during the hunting season, there were few whites that would have vouched for Indigenous ownership of firearms. Townsfolk, pastoralists, missionaries and miners all wanted Aborigines disarmed. An incident was reported at Oenpelli where an Aboriginal man shot another who he was allegedly displeased with for lagging behind. The aggressor then disposed of the deceased in what appeared to be a ritual dismemberment. It led to a riot at Oenpelli with other Aboriginal people fearing that he would come and kill others who displeased him and they were 'clamouring for firearms with which to defend themselves' (NTTG Friday, 28 October 1910: 3).

This passage informs us about several important issues relating to Indigenous possession of firearms. Few Aboriginal people in the Oenpelli camp in 1910 had access to a rifle. Men were usually only officially issued with firearms during the buffalo season. However, as the above account makes clear some senior Aboriginal men did own firearms which were outside of European control and which they could use to exercise their authority. Incidents such as this reported by the local newspapers resulted in the enactment of legislation to prohibit Indigenous ownership of firearms.

Firearms, however, continued to be used by Aboriginal men throughout the 1920s and 1930s while they were engaged in the buffalo shooting industry. White buffalo shooters had to seek permits from the Administrator to authorise their use by Aboriginal men. Certainly by the late 1930s, there are fewer public records referring to Indigenous ownership of firearms. During World War II, the Australian military had a deliberate policy of disarming Aboriginal men and placed many Aboriginal people in work camps between Darwin to Alice Springs to enable managing their welfare and to provide a labour supply (Guse 2006; Saunders 1995). Therefore it is not surprising that there is currently only one recorded depiction of a post-1900 rifle in the Arnhem Land rock art assemblage (Table 3). This painting may coincide with activities from World War II. The subsequent paucity of firearm paintings from this period may also relate to the general contraction of occupation from the sandstone escarpment and movement of the Indigenous population into regional centres such as Darwin, Pine Creek, Oenpelli, Waruwi, Minjalang and Katherine

(Brockwell et al. 1995; Dewar 1992; Forrest 1985; Grant 1995; Levitus 1995; Ritchie 1998).

## Conclusion

Firearms in Arnhem Land rock art illustrate a particular chapter in the Indigenous history of the Northern Territory. The meaning behind the depictions of firearms is multi-layered and contains an Indigenous narrative to which we no longer have access. On the other hand, depictions of firearms may provide an insight into ownership and the symbolic importance and social status these weapons had to Indigenous people. The history of Indigenous ownership of firearms in the Northern Territory closely mirrors the social attitudes of white Australians to Aboriginal people in the 19th and 20th centuries. For a period of time Aboriginal people were part of a productive hybrid economy in the buffalo shooting industry and firearm ownership was tolerated. Firearm ownership declined with the enforcement of new laws and the end of freely distributed firearms and ammunition from buffalo shooters by the end of the 1930s. This decline is paralleled in the rock art, and with the exception of a single drawing of a Lee Enfield, all firearms depicted are models from pre-1900.

## Acknowledgments

This research was funded by an Australian Research Council Linkage grant LP0882985. The author would like to acknowledge the following people for their assistance in the fieldwork and preparation of this paper: Traditional Owners Charlie Mangulda, Ronald Lamilami, Mark Mangiru, Donny Namundja and Jacob Nayinggul (dec.), for permission to undertake the field work and use the information for this paper. The field data were collected with assistance from Richard Woolfe, Jason Raupp, Ben Keys, Sally May, Ines Domingo Sans. Field work was facilitated by Ian White, Northern Land Council and the Jabiru Regional Office. Additional assistance in the field was kindly provided by Cameco Australia, Office of the Supervising Scientist, NRETAS, and Bushfires Council of the Northern Territory. Firearms identification was assisted by John White from the Australian War Memorial and historical archaeologist Colin de la Rue. The final paper has benefited from comments and suggestions made by Sue O'Connor, Jack Fenner, Sally Brockwell, Katherine Siekel, Chris Chippindale, Ian White and 'ben' Gunn.

Daryl Wesley

Department of Archaeology and Natural History  
School of Culture, History and Language  
College of Asia and the Pacific  
The Australian National University  
Canberra, ACT 2601  
Australia  
daryl.wesley@anu.edu.au

## REFERENCES

ALLEN, J. 1969. Archaeology and the history of Port Essington. Unpubl. PhD thesis, Department of Prehistory, Australian National University, Canberra.

- ALLEN, J. 1972. Port Essington: a successful limpet port? *Historical Studies* 15(59): 341-360.
- ALTMAN, J. C. 2007. *Alleviating poverty in remote Indigenous Australia: the role of the hybrid economy*. Centre for Aboriginal Economic Policy and Research, Topical Issue No. 10.
- BAUER, F. H. 1964. *Historical geography of white settlement in part of the Northern Territory, Part 2. Katherine-Darwin region*. CSIRO Division of Land Research and Regional Survey, Divisional Report 64/1, Canberra.
- BERNDT, R. M. and C. H. BERNDT 1954. *Arnhem Land: its history and its people*. F.W. Cheshire, Melbourne.
- BRANDL, E. J. 1982. *Australian Aboriginal paintings in western and central Arnhem Land: temporal sequences and elements of style in Cadell River and Deaf Adder Creek art*. Australian Institute of Aboriginal Studies, Canberra.
- BROCKWELL, C. J., R. LEVITUS, J. RUSSEL-SMITH and P. FORREST 1995. Aboriginal heritage. In T. Press, D. Lea, D. Webb and A. Graham (eds), *Kakadu: natural and cultural heritage management*, pp. 15-63. ANCA and NARU, Darwin.
- CAPELL, A. and H. E. HINCH 1970. *Maung grammar: texts and vocabulary*. Mouton, The Hague.
- CHALOUPEK, G. 1993. *Journey in time: the 50,000 year story of the Australian rock art of Arnhem Land*. Reed Books Australia, Chatswood.
- CLARKE, A. 1994. Winds of change: an archaeology of contact in the Groote Eylandt archipelago, northern Australia. Unpubl. PhD thesis, Australian National University, Canberra.
- CLARKE, A. 2000a. Time, tradition and transformation: the negotiation of cross-cultural engagements on Groote Eylandt, northern Australia. In R. Torrence and A. Clarke (eds), *The archaeology of difference: negotiating cross-cultural engagements in Oceania*, pp. 142-181. Routledge, London.
- CLARKE, A. 2000b. 'The moormans trowsers': Macassan and Aboriginal interactions and the changing fabric of Indigenous social life. In S. O'Connor, S. and P. Veth (eds), *East of the Wallace Line: studies of past and present maritime cultures of the Indo-Pacific region*, pp. 315-335. AA Balkema, Rotterdam.
- CLARKE, A. and U. FREDERICK 2011. Making a sea change: rock art, archaeology and the enduring legacy of Frederick McCarthy's research on Groote Eylandt. In M. Thomas and M. Neale (eds), *Exploring the legacy of the 1948 Arnhem Land expedition*, pp. 135-155. ANU E-Press, Canberra.
- CONNAH, G. 1988. *'Of the hut I build': the archaeology of Australia's history*. Cambridge University Press, Cambridge.
- DEWAR, M. 1992. *The 'Black War' in Arnhem Land: missionaries and the Yolngu 1908-1940*. ANU, North Australia Research Unit, Darwin.
- DUCKERS, P. 2005. *British military rifles 1800-2000*. Shire Publications, Buckinghamshire.
- EDWARDS, R. 1979. *Australian Aboriginal art: the art of the Alligator Rivers region, Northern Territory*. Australian Institute of Aboriginal Studies, Canberra.
- FLINDERS, M. 1814. *A voyage to Terra Australis 1774-1814 Volumes 1 and 2*. G. and W. Nicol, London.
- FORREST, P. 1985. An outline of the history of the Gunbalanya locality. Unpubl. report for F.A.C.T.S. Pty. Ltd., Darwin.
- FREDERICK, U. 2000. Keeping the land alive: changing social contexts of landscape and rock art production. In R. Torrence and A. Clarke (eds), *The archaeology of difference: negotiating cross-cultural engagements in Oceania*, pp. 300-330. Routledge, London.

- GILRUTH, J. A. 1923. Paddy Cahill. Bushman, hunter, sailor. *The Argus*, 10 February, p. 4.
- GOON, K. 1995. Southport: the story of the 'Dump in the mangroves'. Unpubl. report held by Northern Territory Library, North Australia Collection, Darwin.
- GRANT, A. 1995. *Aliens in Arnhem Land*. Frontier Publishing, Dee Why.
- GUNN, R. G. 1988. Rock art in Kudjumarndi and Kukulak areas – western Arnhem Land. Unpubl. report to the Northern Land Council, Darwin.
- GUSE, D. 2006. 'My country my home' land, law, and cultural heritage: a case study in the Northern Territory, Australia. Unpubl. MA thesis, Charles Darwin University, Darwin.
- HALL, J. N. 1916. *Kitchener's mob: the adventures of an American in the British Army*. Houghton Mifflin Company, Michigan.
- HALLS, C. 1974. *Guns in Australia*. Paul Hamlyn, Dee Why West.
- JELINEK, J. J. 1989. *The great art of the early Australians: the study of the evolution and role of rock art in the society of Australian hunters and gatherers*. Moravian Museum, Anthropos Institute, Brno.
- KING, P. P. 1827. *Narrative of a survey of the intertropical and western coasts of Australia: performed between the years 1818 and 1822. Volume 1*. John Murray, London.
- LEICHBARDT, L. 1847. Journal of an overland expedition in Australia, from Moreton Bay to Port Essington, a distance of upwards of 3000 miles, during the years 1844–1845. T&W Boone, London; <http://adclibrary.usyd.edu.au/data-2/p00050.pdf>. Accessed 13-2-2013.
- LEVITUS, R. 1982. 'Everybody bin all day work'. A report on the social history of the Alligator Rivers region of the Northern Territory 1869–1973. Unpubl. report to the Australian National Parks and Wildlife Service, Canberra.
- LEVITUS, R. 1995. Social history since colonisation. In T. Press, D. Lea, A. Webb and A. Graham (eds), *Kakadu: natural and cultural heritage management*, pp. 64–93. Australian Nature Conservation Agency and the North Australia Research Unit, Darwin.
- LEWIS, D. 1988. *The rock paintings of Arnhem Land, Australia: social, ecological and material culture change in the post-glacial period*. BAR International Series 415, Oxford.
- LUGS, J. 1973. *Firearms past and present: a complete review of firearm systems and their histories*. Grenville, London.
- MACKNIGHT, C. C. 1969. The Macassans: a study of the early trepang industry along the Northern Territory coast. Unpubl. PhD thesis, Australian National University, Canberra.
- MACKNIGHT, C. C. 1986. Macassans and the Aboriginal past. *Archaeology in Oceania* 21: 69–75.
- MAY, S. K., P. S. C. TAÇON, D. WESLEY and M. TRAVERS 2010. Painting history: indigenous observations and depictions of the 'other' in northwestern Arnhem Land, Australia. *Australian Archaeology* 70: 29–37.
- MENNEN, I. J. and L. RUSSELL 2002. Ritual response: place marking and the colonial frontier in Australia. In B. David and M. Wilson (eds), *Inscribed landscapes: marking and making place*. University of Hawai'i Press, Honolulu.
- MITCHELL, S. 1994. Culture contact and Indigenous economies on the Cobourg Peninsula. Unpubl. PhD thesis, Northern Territory University, Darwin.
- MOUNTFORD, C. P. 1956. *Records of the American-Australian scientific expedition to Arnhem Land. Vol. 1: art, myth and symbolism*. Melbourne University Press, Melbourne.
- MULVANEY, D. J. and N. GREEN 1992. *Commandant of solitude: the journals of Captain Collet Barker, 1828–1831*. Melbourne University Publishing, Melbourne.
- MULVANEY, D. J. 2004. *Paddy Cahill of Oenpelli*. Aboriginal Studies Press, Canberra.
- NTTG (Northern Territory Times and Gazette) Darwin, NT: 1873–1927, <http://nla.gov.au/nla.news>, accessed various dates.
- O'NEIL, J., W. JOHNSTONE and P. CAHILL 1910. Buffaloes in the Territory. *The Advertiser* 20 July, p. 4.
- OUZMAN, S. 2005. The magical arts of a raider nation: central South Africa's Korana rock art. *South African Archaeological Society Goodwin Series* 9:101–113.
- PAULY, R. 2004. *Firearms: the life story of a technology*. Greenwood Technologies, Greenwood Press, Connecticut.
- PIKE, G. 1972. *Frontier Territory: the colorful story of the exploration and pioneering of Australia's Northern Territory*. G. Pike, Darwin.
- POWELL, A. 1988. *A far country: a short history of the Northern Territory*. Melbourne University Press, Melbourne.
- PORR, M. and H. R. BELL 2012. 'Rock art', animism' and two-way thinking: towards a complementary epistemology in the understanding of material culture and 'rock art' of hunting and gathering people. *Journal of Archaeological Method and Theory* 19(1): 161–205.
- REYNOLDS, H. 2006. *The other side of the frontier*. UNSW Press, Sydney.
- RITCHIE, D. 1998. A painful wrench for a European mind: land claims and representation of history and Aboriginal tradition in the Darwin hinterland. Unpubl. PhD thesis, Deakin University, Melbourne.
- ROBERTS, D. A. and A. PARKER 2003. *Ancient ochres: the Aboriginal rock paintings of Mount Berrandale*. J.B. Books, Marleston.
- SAUNDERS, K. 1995. Inequalities of sacrifice: Aboriginal and Torres Strait Islander labour in northern Australia during the Second World War. *Labour History* 69: 131–148.
- SKENNERTON, I. D. 1975. *Australian service longarms*. I. D. Skenner-ton, Margate.
- SPENCER, B. 1928. *Wanderings in wild Australia*. Macmillan & Company Limited, London.
- TAÇON, P. S. C., S. K. MAY, S. J. FALLON, M. TRAVERS, D. WESLEY and R. LAMILAMI 2010. A minimum age for early depictions of Southeast Asian Praus. *Australian Archaeology* 71: 1–10.
- TORRENCE, R. and A. CLARKE 2000. Negotiating difference: practice makes theory for contemporary archaeology in Oceania. In R. Torrence and A. Clarke (eds), *The archaeology of difference: negotiating cross-cultural engagements in Oceania*, pp. 1–31. Routledge, London.
- WARRIBURTON, C. 2009. *Buffaloes: life and adventure in Arnhem Land*, 3rd edn. Gecko, Marleston.
- WESLEY, D., J. F. MCKINNON and J. T. RAUFF 2012. Sails set in stone: a technological analysis of non-indigenous watercraft rock art paintings in north western Arnhem Land. *Journal of Maritime Archaeology* 7(2): 245–269.
- WESTWOOD, D. 2005. *Rifles: an illustrated history of their impact*. ABC Clio, Santa Barbara.
- WILSON, T.B. 1837. *Narrative of a voyage round the world*. Gilbert and Rivington Printers, London.
- YATES, R., A. MANHIRE and J. PARKINGTON 1993. Colonial era paintings in the rock art of the south-western Cape: some preliminary observations. *Historical Archaeology in the Western Cape* 7: 59–70.

## **An End to Contact Imagery in Indigenous Rock Art, Arnhem Land**

Authors:

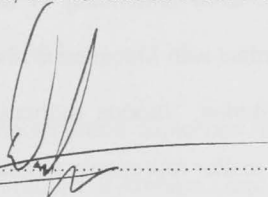
Daryl Wesley

Jessica Viney

Publication: Journal of Australian Aboriginal Studies

Current status: Accepted with revision

Coordinated and conducted the rock art survey and recording of Djulirri and Bald Rock 1 (Maliwawa) during 2008-2010. Collated the survey data for further analysis. Undertook basic classification of the rock art assemblage. Composed the overall question, Indigenous ethnographic background research, rock art analysis, D-Stretch, discussion, and conclusion of this research paper.

Signed:  .....

Mr. Daryl Wesley

Undertook background archival research on the HMAS Gayundah and the HMAS Moresby for the paper at the National Library of Australia, Australian War Memorial and National Australian Archives. Developed spreadsheets on data about the chronology and technology of the HMAS Gayundah. Prepared a summary of the 1911 expedition of the HMAS Gayundah.

Signed:  .....

Ms. Jess Viney

## Australian Aboriginal Studies

Title: **AN END TO CONTACT IMAGERY IN INDIGENOUS ROCK ART, ARNHEM LAND**

Daryl Wesley<sup>a</sup>

[Daryl.wesley@anu.edu.au](mailto:Daryl.wesley@anu.edu.au)

Jessica Viney<sup>b</sup>

[u4851945@uds.anu.edu.au](mailto:u4851945@uds.anu.edu.au)

<sup>a</sup>Australian National University, Archaeology and Natural History

<sup>b</sup>Australian National University

### ABSTRACT

Research has revealed that rock art traditions were continuing in western Arnhem Land throughout the period of culture contact with Macassans and later European settlement in the 19<sup>th</sup> and 20<sup>th</sup> Centuries. Various authors have indicated that painting of non-Indigenous subject matter represents a method of contextualising outsiders, the new relationships that were formed, and the reorganisation of Indigenous perspectives and world views. Despite evidence of Indigenous painting in rockshelters having continued through to recent times, it has also been clearly demonstrated that painting in the sandstone escarpment significantly declined post 1945 in favour of painting on other media for a variety of reasons. The painting of a warship and a plane in a rockshelter in the coastal Wellington Ranges of north-western Arnhem Land is a significant temporal indicator of when 'introduced imagery', i.e. that of non-Indigenous origin, began to be phased out of rock art and contemporary art production. What is significant here is that the major events of World War II which had a profound and seismic impact on the Northern Territory from 1939-1945 are barely represented in the corpus of contact rock art and contemporary Indigenous art imagery that followed. There is only one image in the Wellington Range contact



rock art that can be reliably dated to 1942 of a Royal Australian Air Force aircraft. It is proposed here that by World War II, Indigenous people in western Arnhem Land processed the differences presented by outsiders and no longer needed to utilise introduced imagery in their art in order to contextualise these changes and relationships. This notion is discussed around the painting of a warship in a rockshelter from the Wellington Range provides a crucial temporal factor in the analysis of this proposition. Painting of ships reflected the continuity of maritime traditions and connections to sea country through the early period of culture contact with Europeans, and modern ships and boats and other modes of mobility become normalised in Indigenous society.

## **Introduction**

Of all the recorded depictions of non-Indigenous ships, boats, and aircraft in the rock art record of Arnhem Land, including the islands in the Gulf of Carpentaria, there are only two motifs that can be identified with a high level of certainty as a modern era navy warship and an air force plane from World War II (Barrett 1946; Burningham 1994, 2000; Cole 1980; Chaloupka 1993, 1996; Clarke 2000a; Clarke and Frederick 2006; Clarke and Frederick 2008; Clarke and Frederick 2011; Edwards 1979; Gunn 1988; Guse 2008; May *et al* 2010, May *et al* 2011; Mountford 1956; Roberts 2004; Tacon *et al* 2010; Tacon *et al* 2012; Turner 1973; Wesley *et al* 2012). Naval shipping (as opposed to civilian and merchant) and military aviation in northern Australia represents a significant part of the Northern Territory's history, especially given the role of Darwin in the South West Pacific Area during World War II (Grey 1999; Powell 1982).

Even though the period of World War II saw a distinct increase in military shipping in Northern Territory coastal waters, it is argued here that the depiction

of the warship in the Djulirri rock art gallery in Arnhem Land is from a pre-World War II period and reflects a particular stage of Indigenous engagement with European attempts to develop north Australia with emerging economies (i.e. trepang fishing, buffalo hunting, pearling) and the missionisation of Arnhem Land. Recent maritime native title and anthropological research conducted for coastal waters around Croker Island and Blue Mud Bay in Arnhem Land has overwhelmingly demonstrated the continuity of Indigenous customary rights and knowledge over the sea which has been retained by Indigenous traditional owners (Barber 2010; Clarke and Johnson 2003; Peterson and Devitt 1996; Morphy 2003; Trigger and Asche 2010, Yunupingu and Muller 2009). The continuity of Indigenous traditions and cultural attachment to the sea through traditional maritime activities and those conducted in association with emerging European economies and missions meant Indigenous peoples were traversing far greater distances of the Northern Territory coast than ever before providing for a range of cross-cultural interactions. On the other hand, the painting of an aircraft at Bald Rock can be dated to a very specific period of World War II and was very likely to be painted in response to wartime experiences of Indigenous people residing at the nearby South Goulburn Island mission.

Interactions between Indigenous people and the Australian Commonwealth armed services during peacetime between Federation in 1901 and World War II is significantly more obscure than those documented during the large scale conflicts of World War I and II. Largely this documentation has been in the form of revealing the wartime roles of Indigenous servicemen and women during these conflicts (Hall 1997; Ball 1991). The reality for most Indigenous north Australians was not active service, but largely support roles through the provision of labour during World War II (Hall 1997; Saunders 1995). In the past,

the narrative of Indigenous Australian interactions with the Australian military was told from the European perspective, however more recently there has been significant increase in literature discussing Indigenous participation World War II (e.g. Hall 1997; Trudgen 2000; Riseman 2007, 2010, 2012a, 2012b, Saunders 1995). Saunders (1995) and Riseman (2007, 2010, 2012a, 2012b) both provide excellent accounts of the role, participation, and the conditions that Aboriginal people endured during World War II across northern Australia through their rigorous investigation of the historic archive and oral history. The service role of Indigenous people in the Northern Territory is mostly documented through their work with the North Australian Observer Unit and participation with surveillance activities of the Northern Territory Special Surveillance Unit (NTSRU) (Gray 2006; Riseman 2007, 2010, 2012a, 2012b). The activities reported by Riseman (2007, 2010, 2012a, 2012b) of the NTSRU primarily focus on eastern Arnhem Land during and after World War II.

Trudgen (2000) details the negative impacts on Yolngu society arising from interaction with the military during World War II. In the study area, Indigenous labour from the Goulburn Island Mission contributed significantly to the operation of the 309 Radar Station on North Goulburn Island from 1943 to 1945, with the islands visited by a variety of military ships and aircraft during this time (Adcock 1999). Despite the significant involvement of Indigenous communities in the various activities of World War II, and the enormous amount war *materiel* involved, it is a conundrum that there is a distinct lack of imagery associated with this period in the contact rock art assemblages of western Arnhem Land. It is proposed that painting of shipping, in particular, and other contact imagery, declines dramatically after the 1930s in the sandstone rockshelters in north-western Arnhem Land.

In response to recent Indigenous narratives documented in Arnhem Land history by McIntosh (1996a; 1996b, 2006, 2009), and counter arguments by Hiscock (2008) and Macknight (2008), an archaeological approach to investigating the issue of early contact with Indonesian seafarers, colonial outposts on the Coburg Peninsula, and later settlement of the Northern Territory after 1870 in western Arnhem Land in the Northern Territory was initiated by through an ARC Linkage grant *Baiyini Macassans, Balanda and Bininj; a case study of culture contact in north western Arnhem Land*. Results of this research in collaboration with other researchers can be found in May *et al* (2010), May *et al* (2011), Tacon *et al* (2010, 2012), Wesley *et al* (2012). During the course of this research, three major contact-period occupation precincts were identified as Djurlirri, Malarrak, and Bald Rock with the Wellington Range (Figure 1). A particular rock art panel and imagery of a warship was recorded at the Djurlirri rockshelter. This image provides a platform to discuss one the earliest Indigenous records of an encounter between the Australian armed services, the Royal Australian Navy, and Indigenous Traditional Owners from western Arnhem Land, Australia (Figure 2).

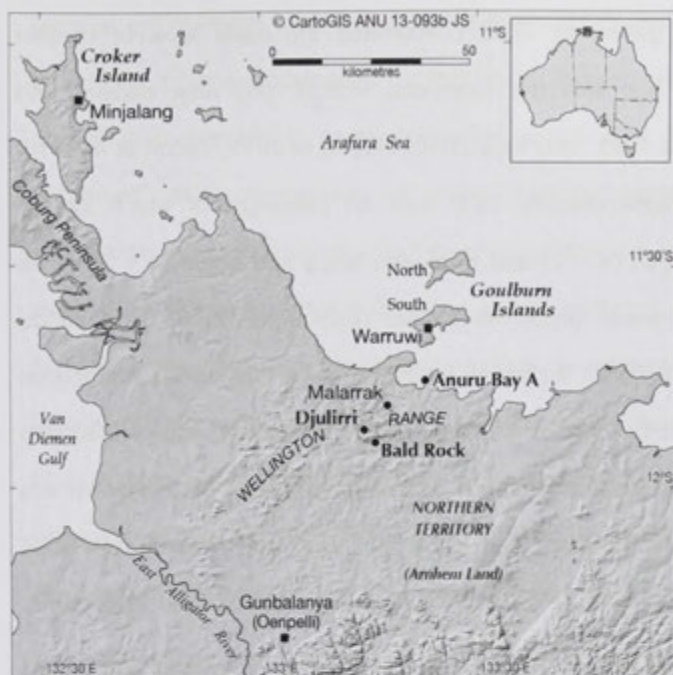


Figure 1. Location of the study area



Figure 2. Rock art panel from Djulirri, Arnhem Land illustrating the maritime imagery recorded by Indigenous artists.

The large rock-art gallery of Djurlirri illustrates the deep level of contact Indigenous groups had with the European visitors and later settlers and missions (Chaloupka 1993; May *et al* 2010; May *et al* 2011; Tacon *et al* 2010, 2012). It contains approximately 1300 rock art paintings, of which 27 are paintings of Indonesian (n = 2) and European ships and boats (n = 25). The images of the Indonesian praus have been radiocarbon dated to a period starting from circa 1650 A.D. indicating a long period of Indigenous interactions with maritime activities (Tacon *et al* 2010). Within this gallery, one painted ship in particular has the distinctive shape and characteristics of a modern era warship (circa late 19<sup>th</sup> Century to early 20<sup>th</sup> Century). The interpretation regarding the class of naval ship it is, which conflict the ship was involved in, and how the ship came to be painted in an Indigenous rock shelter site is the subject of current debate. For example, the interpretations of ships published by Tacon *et al* (2010) received significant (unpublished) criticism from maritime researchers. Public comments regarding this rock art panel featuring the warship have been negative for example, *"Almost certainly a hoax, probably done in the last 30 years"* and *"those works have, amongst other things, perspective. Totally unknown to aboriginal (sic) art... totally fake"* (Sky Scraper City Forum 2008). Therefore it was important to conduct further research and test the type of warship this painting may have been, what conflict it may have been associated with, and the mechanisms behind Aboriginal people painting this ship in the gallery.

Research into the traditions of local Aboriginal Traditional Owners (Maung/Iwaidja), history of the Goulburn and Croker Island missions, and the activities of the post-Federation Australian Navy has led the authors to propose that this rock-art image could be one of two Royal Australian Navy ships; the

colonial era gunboat, HMAS *Gayundah* (John White *pers comm*) or the later World War 1 anti-submarine escort, the HMAS *Moresby* (Michael Pearson *pers comm*) that operated in north Australian waters after 1926 (Bastock 1975; O'Connell 1994). Regardless of which ship the painting represents, the identification of chronological time frames for what is the only painting of a non-merchant ship known so far in Arnhem Land is significant. It provides a platform to discuss the implications of transformations in cross-cultural interactions for local Aboriginal people operating in a much larger maritime seascape than their local estates and territories than prior to Macassan and European contact, and not necessarily related to World War II (Clarke, 2000a, 2000b; Clarke and Frederick 2006, 2008, 2011; Porr and Bell 2012).

There are several issues that need to be addressed regarding the methodology for the identification of the HMAS *Gayundah* or HMAS *Moresby* as the ship depicted at Djulirri given previous critiques of ship motif identification. This includes an investigation of the history of early naval shipping in the Northern Territory, to place the ships in the coastal waters of Arnhem Land at that time, and an examination of the significance of the encounter for Australian Indigenous and maritime history. Without the original Aboriginal painter to provide us with details about the painting, we need to demonstrate the connection and significance of the cross-cultural engagement between the ship and Aboriginal communities in north-western Arnhem Land (Clarke and Frederick 2006, 2008; Porr and Bell 2012). It is also important to discuss the method for identifying this ship from many other warships that were known to operate in north Australian waters especially during World War II. Differentiating the timing of this painting from a period between 1911 and 1945 is significant for our understanding of Indigenous history and continuity of traditional knowledge

and customs in north-western Arnhem Land. Despite ship log books, personal papers, and other archival materials relating to the HMAS *Gayundah* and HMAS *Moresby*, this single rock art image may be the only record of contact or interaction with coastal Indigenous communities by these ships. Importantly, the mission of the HMAS *Gayundah* to target the interception of Indonesian fishing vessels was a potent symbol of the end of the long tradition of culture-contact between Indigenous traditional owners and Indonesian trepang fishermen (Berndt and Berndt 1954; Clarke, 2000a, 2000b; Clarke and Frederick 2006, 2008; Macknight 1976; Mitchell 1994, Russell 2004).

### **Military Ships and Aircraft in Study Area**

A background discussion is warranted to differentiate the history involving military and civilian or merchant class of shipping and aircraft in the Northern Territory. Major maritime shipping during the colonial period of settlement in the Northern Territory consisted mostly of commercial vessels carrying passengers and materials to and from southern ports and the early colonial outposts of Fort Dundas, Fort Wellington, Port Essington, Escape Cliffs and then finally Palmerston (later renamed Darwin). We will largely concentrate on the post-1870s history of the Northern Territory when iron boat construction was more prevalent than during the early colonial era. Darwin (Palmerston) was established in 1869 to assist with the settlement and economic development of the Northern Territory (Powell 1982). A fleet of small ships were permanently stationed there to work in local maritime commerce and shipping. Minor shipping consisted mostly of local coastal fishing boats, pearling in particular, and vessels supplying remote settlements around the Territory coastline such as pastoral stations on the Macarthur River and Victoria River (Bauer 1964; Powell 1982; Roberts 2004). Luggers and schooners were the most common



ships utilised in these industries (Burningham 1994; Roberts 2004). Buffalo shooting enterprises on the Tiwi Islands, Coburg Peninsula, and the Alligator Rivers region also required supply and shipment of hides via these small ships (Mulvaney 2004; Roberts 2004). The early 1900s saw the establishment of a series of Aboriginal missions on the Arnhem Land coastline and islands (Baker 2005; Dewar 1992, Harris 1998). The missions were generally serviced by mission owned luggers or schooners (Cole 1975; Lamilami 1974; McKenzie 1976). Research into historical archives has thus far shown that during the pre-1914 phase of settlement in the Northern Territory, there are no records of modern naval warships of any national origin visiting the Port of Darwin in the Northern Territory.

The Northern Territory was part of the Colony of South Australia from the 1860s to 1911 when administration was handed over to the Commonwealth Government (Bauer 1964; Powell 1982). The South Australian Administration usually possessed a small steamer or vessel that would carry out government work as necessary for the Northern Territory Administrator. This included collecting customs from Indonesian fishermen; police patrols; ship wreck rescues; regular mail runs to missions and pastoral station outposts; government resident doctor inspections; surveying duties; and general colonial government business. Although the South Australian Colonial government purchased a cruiser class iron warship, the *Protector*, it never saw duty in northern coastal waters. Darwin was a very minor port amongst the major South-East Asian destinations with no permanent harbour fortifications or permanent military garrison until 1927 (Powell 1982; Rayner 2001). Therefore the possibility of Indigenous people in the Northern Territory coming into contact with modern naval warships in the 19th and early 20th Century was very limited.

Prior to, and during World War II, the presence of permanent garrisons along the north Australian coastline meant that they would need to be constantly supplied with provisions, fuel, and equipment. Darwin became a focal point of military build-up for all three armed services from 1939 (Rayner 2001). The period of 1939 to 1945 was a period of intense naval and aviation activity in Port Darwin and along the Arnhem Land coast (Rayner 2001). Various vessels and aircraft were used to supply these coastal field positions at Bathurst and Melville Islands, North Goulburn Island, Milingimbi, Gove, and Groote Eylandt. A radar outpost (309RS) was established on North Goulburn Island during the war from May 1943 to February 1945 (Adcock 1999:12; Nottle 2007:106; Vahtrick 2007:113). The 309RS was mostly serviced by aircraft, notably RAAF Avro Ansons (Alford 2011:171; Nottle 2007:106; Vahtrick 2007:113). It is important to note that there were a number of large ships from this period plying Northern Territory coastal waters included the HMAS *Patricia Cam*, SS *Babinda*, SS *Islander*, SS *Sobigo*, SS *Alagna*, SS *Burwah*, SS *Macumba*, SS *Southern Cross*, SS *Edna* and the HMAS *Maroubra* (Rayner 2001). RAN corvette ships like the HMAS *Castlemaine*, HMAS *Cootamundra*, HMAS *Latrobe* and armed motor launches escorted these cargo ships to provide protection especially during 1942 to 1943 when Japanese aerial activity in northern Australia was at its most intense (Alford 2011). Therefore there are a range of potential candidates of armed ships that needed to be considered when examining the Djurlirri painting.

### ***HMAS Gayundah***

Although the HMAS *Gayundah* is one of Australia's least famous warships, this vessel saw active and reserve service for 36 years in the Queensland Colonial

and Royal Australian Navy (RAN) from 1884 to 1920, including World War I, and had a length of naval service that was only recently surpassed by the HMAS *Brunei* in 2008 (Figure 3). In total the vessel had a lengthy 74 year maritime career on the water. The *Gayundah* went on to work in a civilian capacity as a sand and gravel barge for a further 38 years after decommissioning until being scuttled as a breakwater at Picnic Point, Redcliffe, Queensland and was one of the few gunboats that came into the possession of the RAN at Federation. HMAS *Gayundah* was one of two sister ship gunboats. She was specifically designed to operate in shallow coastal waters and one of the first all iron naval vessels to see service in Australia. Another interesting aspect of her history was that she and her sister ship were given the Indigenous language names, *Gayundah* (lightning) and *Paluma* (thunder) before the RAN tradition was established using names of cities and towns in Australia. In later years of service the *Gayundah* was relegated to a primarily training role in Queensland.

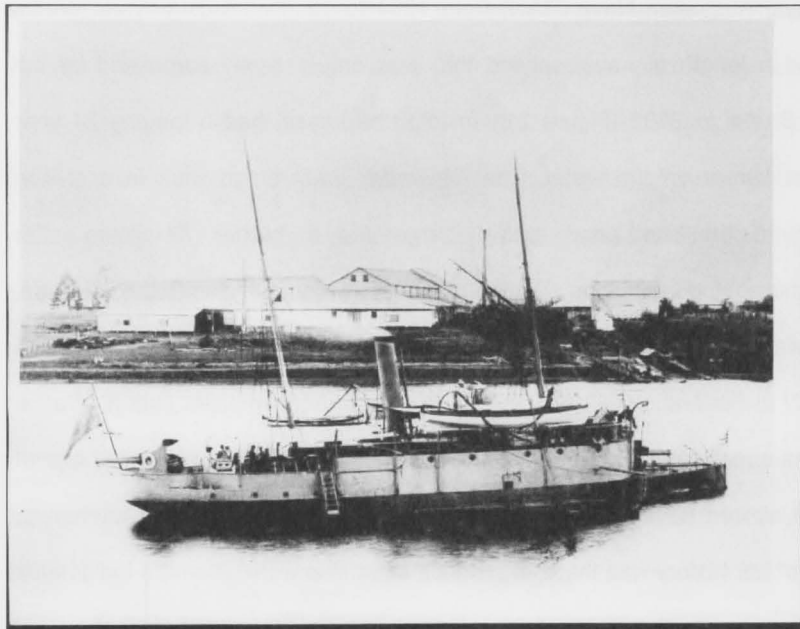


Figure 3. HMQS Gayundah in the Burnett river near Bundaberg 1890. Series number: **J3088** National Archives of Australia. (Copyright Expired – Public Domain)

HMAS *Gayundah* was 36 metres in length and as of 1911 was fitted with a six-inch forward gun, a 4.7 inch rear gun in an open turret, two 12 pounder guns and two machine guns. Power was supplied by a horizontal direct action compound steam engine with twin propeller screws giving the ship approximately 10.5 knots cruising speed. Notable design characteristics included the very low profile of the ship where the gunwhales were low to the water and the bow was not raised so as to allow the forward facing gun an unobstructed firing view. In 1914, along with other ships, she was upgraded with a higher bow for increased seaworthiness and the forward firing gun was abandoned. She had a single raked funnel, and in her original construction had two masts. The masts were later rigged with Marconi wireless lines. Also contributing to the distinctive appearance of this ship is the superstructure

above deck which was shaded by canvas. During peace time in the pre-World War 1 period, the *Gayundah* was painted all white above the water line, typical for the period. Naval vessels during wartime would later be painted in dark grey or camouflage.

The 1911 voyage of the HMAS *Gayundah* and its significance in Australian history has been previously described in an article in SEMAPHORE (Issue 10:2006). Australian Federation in 1901 saw all colonial military assets, responsibilities, and powers transferred to the Commonwealth. Within a decade of Federation, the RAN command realised that they had limited intelligence about northern waters and the operational capacity of northern ports to tender naval vessels. Even the then serving Minister for Customs noted that up to 1911, in northern Australian waters "...hitherto there had been practically an absence of Commonwealth Authority." There also appeared to be a large knowledge gap within the naval command about the assets at existing harbours and other potential ports in north Australia, which is an important historical factor for both the *Gayundah* and the *Moresby*.

Other historical factors to consider are events surrounding fishing vessels sailing from Indonesia to north Australian waters. The Commonwealth had instituted new customs and immigration laws in 1907 to regulate the fishing activities of South East Asians in Australian waters (Macknight 1976; Mitchell 1994). South East Asian fishermen could fish in Australian waters, but were subject to severe customs and licencing duties. Trepang and pearling fishermen attempted to avoid these newly introduced duties and started illegally fishing in waters that they considered to be their own traditional fishing grounds established over several centuries (Stacey 2007). With the transfer of

responsibilities from the States to the Commonwealth for customs, border protection, and management of coastal territorial waters, Illegal fishing was thrust onto the Commonwealth government agenda from an early period after Federation. Therefore, the Departments of External Affairs and Trade and Customs with the RAN established the 'special cruise' mission for the HMAS *Gayundah*.

HMAS *Gayundah*, under the command of Commander G.A.H. Curtis, departed Brisbane on the 22 April 1911. Curtis had two directives, to deal with illegal fishermen and report on coastal defence readiness, and he proceeded directly to Broome, Western Australia. The *Gayundah* apprehended two schooners at Scotts Reef, 250km north of Broome with a hold full of trepang and trochus shell. The crew of 30 identified themselves as being from the port of Kupang, West Timor. It was on the return trip to Brisbane that Commander Curtis turned more attention to the second part of his mission to survey the northern coastline for potential naval bases and defensive readiness. The HMAS *Gayundah* arrived in Darwin on the 23<sup>rd</sup> July 1911 and subsequently Curtis anchored in the Bowen Strait between the southern end of Croker Island and mainland Arnhem Land for three days from the 30<sup>th</sup> July to the 1<sup>st</sup> August 1911. This is significant for several reasons. Firstly, Curtis wanted to survey the harbours of the former Fort Wellington and Port Essington on the Coburg Peninsula (Figure 1). This is also the area where local Indigenous Traditional Owners frequently crossed the strait between Croker Island and the mainland. By 1911, there was a great deal of mobility by various traditional land owning groups between the Coburg Peninsula, Croker Island, and adjoining areas, including the nearby Wellington Range where the Djulirri rock-art gallery is located. Lastly, the nearby point on Croker Island was a former customs station and was frequently used by

Europeans. It was during this early period it operated as a base of operations for their buffalo shooting and pearl diving activities and also acted as a point of congregation for local Traditional Owners to either gain employment with the Europeans or trade for goods and tools. Therefore, the likelihood of Indigenous traditional owners coming into contact with the HMAS *Gayundah* during this time is extremely high.

Details in the log book entries from this voyage, and particularly for these three days in July and August 1911 are sparse. There is no mention of encounters with any Aboriginal people. It should be noted however that throughout the journey, Curtis very rarely entered any information about making local Indigenous contacts, even at places where this would have been very likely at the harbours of Thursday Island, Darwin, and Broome. It would seem that local Indigenous contact was not his concern during this mission. Log entries in general offer only the briefest of details regarding the day to day activities of the ship. Given the nature of the mission collecting intelligence on the defence aspects of northern Australia secret, it is possible that Curtis may have kept a separate diary of events and notes regarding this aspect of his mission. The lack of identification and detail in the log is obvious when the HMAS *Gayundah* was tasked to pick up an anonymous 'scientific party' from the Roper River in the Gulf of Carpentaria. It was only with further research that this scientific party is identified as that of the famous anthropologist Baldwin Spencer.

Despite being the first RAN vessel to visit any Australian ports or waters north of Townsville, press coverage of the 1911 voyage was mostly limited to arrival and departure notices until the *Gayundah* apprehended the two foreign fishing vessels near Broome, although the Brisbane Courier did report that the

*Gayundah*'s destination was being withheld as 'secret'. In Darwin, the Northern Territory Times and Gazette reports that although 'the *Gayundah* is not a Great Eastern', the Officers were invited to attend the Administrator's "At Home at the Residency" annual function, with the first mention of the ships destination as Broome.

### ***HMAS Moresby***

After the report by Commander Curtis highlighting the deficiencies of the knowledge and charts available of north Australian waters, the HMAS *Moresby* was tasked with undertaking coastal surveys and improving nautical charts along the Arnhem Land coast. HMAS *Moresby*, formerly HMS *Silvio*, was put into service with the RAN in 1925 (Bastock 1975:100). The *Moresby* is shown in Figure 4 as having both fore and aft masts, which was an unusual feature for modern warships (Bastock 1975:100). The shape of the ship is also unusual in that it was built by the British in World War I as an anti-submarine escort and therefore had the unusual profile of the bow and stern looking very similar in order to confuse U-Boats as to which way the ship was heading. The *Moresby* was converted for use in a surveying role from 1926 to 1929. O'Connell (1994:6) describes her conversion in 1925 that both bow and stern of the "*...MORESBY seem to have emerged to be again identical. The guns were removed. A long wide boat deck was superimposed at the bridge wheelhouse level and a suite suited to the needs of a captain of such a vessel added aft of the "dummy" bridge.*"



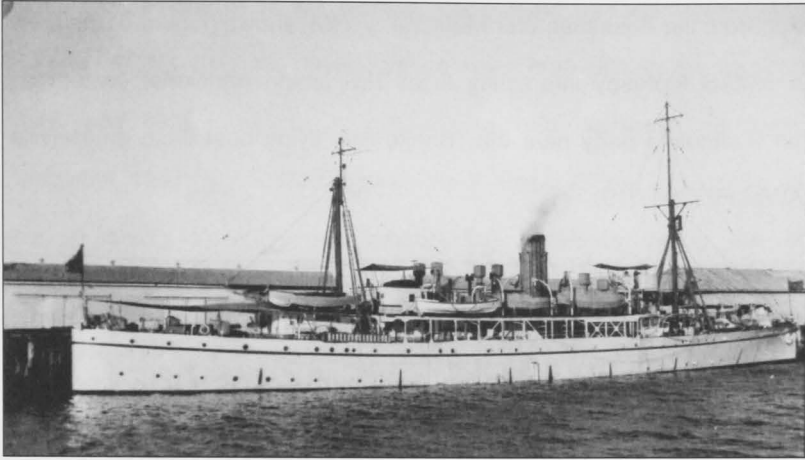


Figure 4. HMAS Morseby Circa 1933, Bowen, Queensland (Joseph William Bell, State Library of Queensland [John Oxley Library]. (Copyright Expired – Public Domain).

She was kept in a reserve role until refitting with oil firing engines and recommissioned in 1935 and later sent to Darwin to survey the Clarence Strait, with other major duties involving surveying the Great Barrier Reef (Bastock 1975:100; O'Connell 1994:6). At the outbreak of World War II HMAS Moresby was involved in patrolling the east coast of Australia, until she was re-armed for convoy escorting in 1941 (Bastock 1975:100). It was after 1941 that the Moresby made numerous appearances in Darwin during the war years operating in the South West Pacific Area (SWPA) on convoy escort duty. During her service in the north, there were encounters with Indigenous people in Queensland and the Northern Territory. In 1935 the Northern Standard reported that the Aboriginal crew, aboard the *Moresby* whilst the ship was conducting survey work, complained of the working conditions undertaking the majority of '*heavier and dirtier*' tasks, as well as their low wages. The article goes on to say that the Aboriginal crew had "...warned other boys not to accept employment should the vessel return to Darwin waters for survey work." A 1944

photograph from the Australian War Memorial (AWM) shows (Figure 5) the crew from the HMAS Moresby interacting local Tiwi Island traditional owners as guides on a shooting party near the Snake Bay flying boat base on Melville Island (AWM:P02305-019).



Figure 5. HMAS Moresby shooting party on Melville Island 1944 (Australian War Memorial P02305-019) (Copyright Expired – Public Domain)

### ***RAAF Avro Anson***

The Avro Anson was a twin engine aircraft designed as a light bomber. The RAAF began to acquire the British built planes (FIGURE 6) in 1938 and later went on to manufacture 300 of them in Australia (Northern Standard 1940:11). RAAF Avro Anson squadrons begin to arrive in Darwin in 1938 as part of the Northern Territory coastal defence build-up, firstly on long distance flying tests and then posted on a permanent basis in 1939 (Alford 2011; NTTG 1938:2). With the outbreak of World War II, the Avro Anson squadrons were tasked with aerial survey and photography of the Northern Territory coastline and had

begun regular patrols of the Arnhem Land coast by December 1939 (Alford 2011:14; NTTG 1939:4). These aircraft were marked with the traditional red, white, and blue roundels. After engaging with Japanese air forces from December 1941, the RAAF ordered the removal of the red centre from the roundel owing to numerous 'friendly fire' incidents during the Malayan campaigns in June 1942 as Allied aircraft could be easily confused with the Japanese Rising Sun symbol (Dunn 2003). All RAAF aircraft from June 1942 to 1945 have only blue and white identification roundels painted on wings and fuselage (Cochrane and Elliot 1998:13). Therefore this is a significant temporal identifier for depictions of RAAF aircraft in the Northern Territory during World War II. Early in the Pacific War, the Avro Anson was found to be a poor performer as a bomber or attack aircraft and was relegated to supply and transport duties, which it performed exceptionally in the Northern Territory through World War II (Alford 2011:171-173). Avro Anson aircraft were used by 6 Comm Unit (notably commanded by Flight Lieutenant Clyde C. Fenton, the renowned Northern Territory Flying Doctor) to transport and supply remote RAAF stations during World War II (Alford 2011:171-173). The 309 Radar Station (RS) based on North Goulburn Island from 1943 to 1945 was regularly supplied, via the South Goulburn Island Mission airstrip, by a variety of RAAF aircraft including the Avro Anson (Nottle 2007:106; Vahtrick 2007:113).



Figure 6. RAAF Avro Anson circa 1940 in flight (Australian War Memorial P 128002) Copyright Expired – Public Domain.

### Aboriginal People and the Sea

There are several factors that need to be taken into account when discussing Indigenous depictions of maritime watercraft. This includes the detailed maritime knowledge held by Indigenous people of coastal Arnhem Land and their artistic skill and observational ability (Berndt and Berndt 1954; Morphy 1991). Indeed in the submission to the Croker Island Native Title case, Andrew Yarmirr gave evidence:

*"...of hunting turtle and dugong by canoe and by boat in the sea identified by reference to Point David, Darch Island, Grant Island, McCluer Island, Cape Croker, Oxley Island, Lawson Island. He gave some emphasis to the identity of Croker Island men as hunters or "salt water man", "from the sea", or "out in the sea". They fish "in the sea". He hunts dugong in the "deep water" at low tide and "close to the shore" at full tide."*

Indigenous men became proficient mariners working at first with South East Asian fishing fleets and then later serving as crew on European ships, especially during the mission times (Clarke 2000a; 2000b; Macknight 1976; Morphy 1991). Arising from investigations from the Croker Island native title sea claim, Charlie Wardaga differentiated people from the islands and those from the mainland on the basis of their seamanship skills (Peterson and Devitt 1996:6). Charlie Wardaga states:

*"They don't know boats .... all the bushmen ... Island people, he (they) can't get trouble because he is all 'good captain', you know. Good captain in driving the boat - big boat, [and] little boat...We come across from island to Minjalang area - we never lose (get lost)...But some people from mainland little bit myall (ignorant) you know. He don't understand, he didn't learn to captain - all not good, that one. Only island people, maldalguguj people, all the champions for canoe - and by boat. But a long time ago, [there was] no [metal] boat - only canoe from island, or [from] Goulburn, and [from] here, by sail - and paddle - that another one again, [when there's] no wind."* (Peterson and Devitt 1996:6)

Arising from the continuity of maritime traditions during the contact period, Indigenous painters became very familiar with the technology of the new shipping and sailing and their paintings reflected the changing technologies between 18th Century and 20th Century maritime industries (Burningham 1994; 2000; Chaloupka 1988; 1993; 1996; Clarke and Frederick 2008; 2011; Cole 1980; May et al 2010; 2011; O'Connor and Arrow 2008; Roberts 2004; Turner 1973).

The first European records of Indigenous interaction with maritime technologies and economies in coastal Northern Territory waters come from Phillip Parker King's (1827) account of the Aboriginal inhabitants of Goulburn Island. During a prolonged encounter with an Aboriginal group on Goulburn Island, Aboriginal men at one point attempted to steal King's (1827) longboat and in retaliation his crew took possession of a dugout canoe from an abandoned Aboriginal campsite. Numerous records and stories have shown that Aboriginal men

participated in the trepang fishing industry and worked as crew aboard South East Asian sailing vessels (see Berndt and Berndt 1954; Clarke 1994; Lamilami 1974; Macknight 1976; MacGillivray 1852; Mitchell 1994; Morphy 1991; Warner 1937). Therefore by the time Europeans arrived in the 19th Century in Arnhem Land, coastal Aboriginal people were already accomplished mariners using dugout canoes and a number would have developed skills and a familiarity of maritime sailing technologies, through contact with Macassans and the settlements at Fort Wellington and Port Essington on the Coburg Peninsula.

Records illustrate the close interaction of Aboriginal men and sailing vessels with documented cases of going aboard and being employed in various tasks at the colonial settlements. Following their closure, buffalo shooting, trepang fishing, and pearl diving industries developed around the Arnhem Land coastline in various places after the 1870s (Mitchell 1994; Christopherson 2010; OALC 1981:5). Aboriginal groups became involved in these industries and were employed to crew the luggers and schooners that used to supply the outposts. Although these industries went into decline in the early 20th Century, the establishment of missions along the Arnhem Land coastline continued the need for maritime shipping activity. Aboriginal crew and skippers operated luggers and smaller craft to supply the settlements of the Methodist and Anglican missions (Lamilami 1974; Harris 1998). Harris (1998:241) states that in 1921 the mission Lugger Holly had a 'half caste' (sic) skipper, Harold Hamilton. The Northern Territory government health official, Dr Jones, reported in 1917 of the Goulburn Island mission that the "...*mainstay of the mission for some time to come from the self-supporting point of view will probably be the development of the trepanging industry*" (NTTG 1917) which required the participation of Indigenous people employing the maritime craft they learnt from Macassans.

This Indigenous participation in the operation of mission boats is aptly demonstrated at the Goulburn Island mission, especially in a series of photographs taken by Axel Poignant in 1954 (NLA Collection). Mission boats and canoes continued to be used not only for transportation of people between the mainland and islands, but also for traditional hunting and fishing (Lamilami 1974). Aboriginal men used dugout canoes and cutters to transport 309RS personnel between North and South Goulburn Island during World War II (Adcock 1999; Vahtrick 2007). Therefore throughout the contact period with Europeans, there is an ongoing relationship and development of nautical skills and knowledge of maritime technologies and European shipping.

Interestingly, Harris (1998:107) states that up until the 1940s, most missions did not have an established policy on Aboriginal culture. In this policy vacuum it was up to individual missionaries to decide on how to govern the mission in relation to Aboriginal cultural practices and beliefs. It would appear that at a number of the Arnhem Land missions, Aboriginal people were given reasonable latitude to practice existing customs, i.e. visit rockshelters, paint rock art, and continue hunting and gathering practices. Harris (1998:108) states that it was unlikely any missionaries of the interwar period knew of what ceremonial or customary activities were occurring during this time. The continuation of these cultural practices was also aided by the seasonal nature of the small scale industries that Aboriginal people were involved in (Levitus 1995).

### **The Warship at Djulirri**

As mentioned earlier, the identification of maritime craft in rock art of Arnhem Land has been contentious (Tacon *et al* 2010; Wesley *et al* 2012). Therefore this section will consider in detail the warship motif and methodology for the

interpretation presented in this paper. Identification of the type and nationality of shipping vessels are a familiar part of wartime history and maritime archaeology (Dellino-Musgrave 2006; Green 1990; McCarthy 2001; Staniforth and Nash 2008). Using similar methods that were developed for the identification of shipwrecks as used in maritime archaeology, it is possible to identify ship types represented in the rock art as demonstrated by Burningham (1994, 2000) and Wesley *et al* (2012). There are several technological achievements in the late 19th Century that notably contribute to this identification process, the development of iron ships, breech loading guns, steam propulsion systems, and communications. Iron ship design made a significant departure from the traditional shape and design of wooden sail powered ships. Previously, muzzle loading cannon required a specific method of reloading and firing. This involved the need to haul cannon backwards and forwards on a gun deck. The introduction of breach loading cannon no longer required the physical movement of the gun and it could be fixed to a platform which allowed the introduction of the turret. Turrets and the breach loading cannon made gun decks obsolete and no longer necessitated the need for the ship to project high off the waterline to accommodate multiple rows of gun decks. This allowed for a significant departure from previous design as warships could now be made with a deck that was low to the water with turrets to create a low profile as a potential target. Late 19<sup>th</sup> Century warships were therefore significantly different in shape from commercial shipping vessels. Prior to these developments, the silhouettes of a sailing ship man-of-war and a large sailing cargo ship would have looked very similar to the casual observer. This period of history of iron warships in Australia is relatively well documented in historical sources (Bastock 1975; Odgers 1982). Iron warships began to be imported to Australia in the 1880s and



ample archival evidence including ships logs, histories, photographs, plans, and documents survive.

There are 27 ship motifs painted in the Djurlirri shelter, including depictions of a number of classes of ships and water craft. The rock art painting of the ship in question depicts the port side view of the naval vessel (Figure 7). It has been painted with an outline and solid infill technique with white, grey, and black pigments. The white and grey provide two deliberate pigment tones, illustrating a waterline and a distinctive keel shape. It has two masts with lines connecting the masts and a forward stay to the bow (Figure 7). The detail of the lines is typical of a radio naval radio array. There are two guns depicted, fore and aft. A single funnel is shown. A bridge is located forward on top of the superstructure above the deck. The bow and stern are steep and not curving like many other ship paintings in the site (Figure 7).

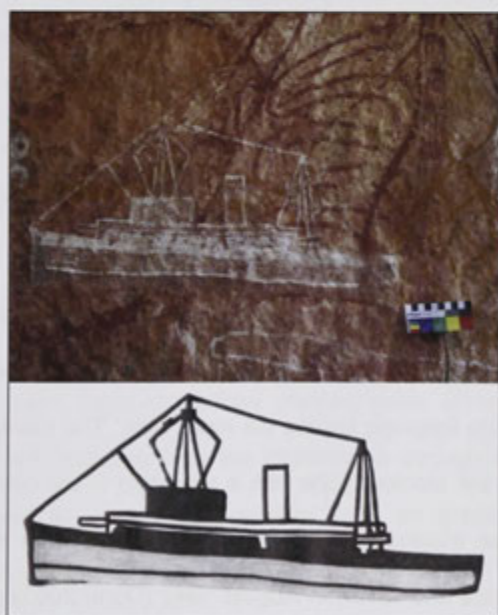


Figure 7. Rock art painting of the warship in Djurlirri, Arnhem Land

The colour scheme, fore and aft masts, radio array, guns without turrets not distinguished from the upper structure, very low bow and stern to the waterline, and distinctive rectangular depiction of the superstructure are all features that closely mirror the design of the Gayundah and Moresby. When compared with photographs of these two vessels, we can see a number of similarities in the layout of the masts, rigging, and superstructure. When compared to other warships of the interwar period, there are very few with twin mast configurations, and even less that were operating in Northern Territory waters.

### **Aircraft at Bald Rock**

In contrast to the Djulirri complex, the Bald Rock complex is formed by three major rockshelters with a series of smaller rock art panels interspersed around the sandstone outliers. The main gallery of the Bald Rock art site contains 542 paintings, beeswax figures, stencils, drawings, a print, and an engraving (Tacon *et al* 2012:432). At this shelter there is a painting of an aircraft that is depicted in perspective similar to some of the ships at the Djulirri site. The motif has been painted with an outline and solid infill method, with further line infill for details within the painting. The outline and line infill is painted in black pigment with possible orange and red pigment infill. Distinguishing aircraft features of the motif illustrate a fuselage, two monoplane wings, a vertical stabiliser (rudder), possible horizontal stabiliser (elevator), cockpit and fuselage windows, and a RAAF roundel on the fuselage behind the main wing. The roundel is significant as it is depicted in the tricolour style with a red circle in the centre. It has been established that the tricolour roundel (red, white, blue) was replaced by the bicolour roundel (blue and white) in August 1942 (Dunn 2003) (See discussion above). The roundel denotes a specific 3 year period of time that the painter

witnessed this aircraft between late 1938 and August 1942. Therefore this motif could not have been painted before 1938. The painting is a reflection of the artists wartime experience of observing the aircraft and suggests rock art production was occurring in the Wellington Range in the decade of the 1940s.



Figure 8. Rock art motif and D-Stretch image of the aircraft from Bald Rock 1.

### **Why Paint Ships and Planes in Rock Art**

The western Arnhem Land sandstone plateau holds an enormous body of Indigenous rock art spanning from the Pleistocene through to the recent past that is recognised as one of the greatest rock art precincts in the world (Chaloupka 1993; Flood 1997; Layton 1992; Morwood 2002). Within this corpus of rock art are depictions of various non-Indigenous watercraft, i.e. Indonesian and European ships and boats. Methods to classify the ships painted in rock art

have been established by a number of studies in western Arnhem Land and elsewhere despite the difficulties in identifying exactly what a rock art motif represents and determining its age (Bednarik 1992; 2002, Burningham 1994, 2000; May *et al* 2009, Lape *et al* 2007; O'Connor and Arrow 2008; Roberts 2004; Tacon *et al* 2010; Wesley *et al* 2012). Despite these methodological difficulties, Arnhem Land rock art researchers have made various attempts to attribute particular rock art paintings to particular historical individuals (e.g. the explorer Leichhardt), named ships, and aircraft (Chaloupka 1993; Roberts 2004; Roberts and Parker 2003). The distortions of time that are generally referred to as a problem of ethnographic analogy are far less of a problem in dealing with the warship motif at Djulirri, as this particular painting can be no older than 1911 (Bednarik 2005). Bednarik (2005) states that *"at least some levels of meaning remain accessible, and justify speculation about the function of such arts in the societies that produced them."* It is also important to discuss the painting of European ships within the context of the Indigenous rock art site at which it was found. The process of identification of a ship in a rock art painting involves issues regarding ethnographic analogy, the existing primacy of European historic records over Indigenous traditions, and the Indigenous traditions that were extant circa 1900AD in north Western Arnhem Land (Wesley *et al* 2012). Porr and Bell (2012) challenge the primacy of Western scientific and literary, academic methodologies in the study of Aboriginal rock art. They (2011:15) state that Indigenous ways of knowing need to be utilised seriously in a critical re-evaluation of the Western scientific endeavour.

Hodder (1998:65) would argue that the painting of the warship motif at Djulirri is part of an intellectual body of knowledge and work that should be differentiated from that of the practical consciousness or habitus. Equally,

Layton (1998:71) argues that in Aboriginal society creative retelling is inherent in the structure of Aboriginal cognition. He (1992:73) contends that Indigenous communities are trying to make sense of wholly new experiences to which they were subject during the colonial period which is revealed through their creative endeavours. Baker (2005:17) challenges historical orthodoxies in the examination of history of Arnhem Land in relation to Aboriginal mission history where *"invasion narratives speak of the chaos associated with un-negotiated crossing of boundaries, trespass, intrusion, death, disruption, dislocation and destruction of local 'culture'"*. She (2005:17) identifies concepts of negotiation and consent vary greatly during the Mission occupation of Arnhem Land throughout the early 20<sup>th</sup> Century. She cites many examples of Indigenous groups *owning* their version of the historic narrative of negotiation with outsiders entering Arnhem Land (Baker 2005). Concepts of two-way learning and negotiation have also been noted by others (e.g. Morphy 1991). Therefore, the rock art at Djulirri and Bald Rock are likely to be an important layer in the Indigenous ownership of a post-colonial narrative and experience.

In the case of western Arnhem Land, in contrast to the contact period rock art, introduced contact imagery, such as European ships, people, boats, animals and guns, are rarely represented in traditional art forms found in historic or contemporary Indigenous artworks (McLean 2011; Sutton 1988; Taylor 1999; Ryan 1990). The other 20<sup>th</sup> Century ships that share the same rock art panel at Djulirri represent specific points in time when European contact experiences were still being represented as a traditional idiom (Layton 1998:73). In contrast, in eastern Arnhem Land contemporary Indigenous art traditions continue to include imagery from the pre-Colonial period representing Macassan culture

contact with incorporation into Yolngu history and dreamings (Morphy 1991; McIntosh 1996, 2006, 2008; Sutton 1988). Layton (1998:76) states that:

*"...it can be argued that there is both a strong, conservative strand in traditional Aboriginal society, which has enabled the impact of colonialism to be withstood, and for traditional rights to land to be asserted in a traditional idiom, and also a creative strand which repeatedly generates new variants of cultural practices and, more rarely, transforms the cultural structure itself."*

It is this process of generating new variants of cultural practices that paintings of European ships emerge for a limited period of time in Indigenous traditional art in western Arnhem Land. Whereas the relationships developed through contact with Macassan culture managed to penetrate through Yolngu cultural structures and have a lasting incorporation into traditional narratives, language, and mythology (McIntosh 1996, 2006, 2008; Morphy 1991; Ryan 1996; Wiseman 1996). On the other hand, World War II imagery is notably lacking in both the rock art record and the contemporary art traditions of western Arnhem Land. There were immense impacts on Indigenous society arising from World War II in northern Australia (Hall 1997; Riseman 2007, 2010, 2012a, 2012b, Saunders 1995, Trudgen 2000). The World War II experiences of Indigenous communities were varied and differed significantly from any that they had encountered before, or after, in terms of the military material culture and activities. Therefore the absence of these experiences is at odds with how Indigenous people had been previously been expressing their cross-cultural experiences with the other through art. It is proposed that by the decade of the 1940s, there had been a fundamental shift in Indigenous perceptions of the European 'other' i.e., ships, aircraft, vehicles, and other material culture, had become part of the larger normative Indigenous experience. Ships, aircraft, trucks, bicycles, firearms, carts, and cars which have all been painted in rock art in western Arnhem Land

had now become part of the normative mobility and economic life of Indigenous society. As a result, Indigenous artists returned to traditional subject matter in their artistic endeavours, whether for commercial or personal reasons, or reasserting their claim to land, sites, and continuing tradition.

## Conclusion

There are multiple impacts that occurred in north western Arnhem Land arising from culture contact from Macassans, early British forts on the Coburg Peninsula, buffalo and maritime enterprises, followed by missions, and then later post-citizenship government supported administration. For a period of time, Macassan and European ships and boats were a significant part of the Indigenous experience which is reflected in the Indigenous rock art of western Arnhem Land. It has also been demonstrated that World War II had a significant impact on Indigenous society in the Northern Territory, however there are very few examples of this experience expressed in the rock art record.

The presence of the warship rock art painting in Arnhem Land points to a number of inter-connections that occurred between the Indigenous people of north western Arnhem Land and the *Gayundah* and *Moresby* and this experience was likely to have been pre-World War II. A primary connection for the Indigenous painter may have been the purpose of the mission of both ships to survey the traditionally owned coastal waters in the Wellington Range area, and possibly the other agenda to intercept illegal fishing activities off the coast of northern Australia. There was possibly little understanding from government decision makers elsewhere during those times of the long association between South East Asian fishermen collecting resources in northern Australia from the early 1700s. Nor would they recognise the potential threat to sacred seascapes



that the naval vessels may have posed during their survey work. The Indigenous painter on the other hand, clearly had a great deal of knowledge of maritime vessels in order to carefully construct such an accurate painting of the warship. The warship and aircraft genuinely represent Indigenous creation and relate to specific temporal experiences during Northern Territory history. These particular motifs mark a period of marked chronological change in Indigenous society in western Arnhem Land in terms of subject matter for rock art and traditional painting.

### **Acknowledgements**

This research was funded by an Australian Research Council Linkage grant LP0882985. The author would like to acknowledge the following people for their assistance in the fieldwork and preparation of this paper: Traditional Owners Ronald Lamilami and his family for their permission and support to undertake the field work and use the information for this paper. The authors would like to acknowledge the assistance with the identification of maritime features by Jennifer McKinnon and Jason Raupp from Flinders University. Field work was conducted in collaboration with Paul Tacon (Griffith University) and Sally May (Australian National University) Picturing Change project. Field work was facilitated by Ian White, Northern Land Council and the Jabiru Regional Office. Additional assistance in the field was kindly provided by Cameco Australia, Office of the Supervising Scientist, NRETAS, and Bushfires Council of the Northern Territory. Ship and aircraft identification was assisted by John White (former Curator of Aircraft, Australian War Memorial) and Michael Pearson in the identification of the naval warship. The final paper has benefited from comments and suggestions made by Sally Brockwell.



## Bibliography

COMMONWEALTH OF AUSTRALIA Appellant and Mary Yarmirr and Others. Federal Court Of Australia Northern Territory District Registry on appeal from His Honour Justice H.W. Olney No. DG 6005 of 1998. NORTHERN TERRITORY & ORS. Second-Eighth Respondents FIRST RESPONDENTS' WRITTEN SUBMISSIONS

OALC 1981. Alligator Rivers stage II land claim. Office of the Aboriginal Land Commissioner, & Australia. Dept. of Aboriginal Affairs. Australian Govt. Pub. Service.

n.d. Melville Island, 1944-10. A shooting party of officers and sailors from HMAS Moresby, with aboriginal guides from the Snake Bay aboriginal settlement, display some of the ducks and geese shot. P02305-019

1935 'WORK ON THE "MORESBY"', Northern Standard (Darwin, NT : 1921 - 1955), 23 August, p. 9, viewed 19 March, 2013, [http://nla.gov.au/nla\\_news-article49426342](http://nla.gov.au/nla_news-article49426342)

Adcock, Neville 1999 *A History of 309 Radar Station*. Neville Adcock, Drumoyne.

Allen, Jim 1972 'Port Essington: a successful limpet port?' *Historical Studies* 15(59):341--360.

Alford, Bob 2011 *Darwin's Air War, 1942-1945: An Illustrated History*. Aviation History Society of the Northern Territory, Darwin.

Ball, Desmond 1991 *Aborigines in the Defence of Australia*. Australian National University Press, Canberra.

Barber, Marcus 2010 'Coastal conflicts and reciprocal relations: Encounters between Yolngu people and commercial fishermen in Blue Mud Bay, north-east Arnhem Land'. *The Australian Journal of Anthropology* 21(3):298-314.

Bastock, John. 1975. *Australia's Ships of War*. Angus and Robertson Publishers.

Barrett, Charles 1946 *Coast of Adventure: Untamed Northern Australia*. Robertson and Mullens, Melbourne.

Bauer, Francis H. 1964 *Historical geography of white settlement in part of the Northern Territory, Part 2, Katherine-Darwin region*. Divisional Report No. 64/1, CSIRO Division of Land Research and Regional Survey, Canberra.

Bednarik, Robert G. 1992 'Palaeoart and archaeological myths'. *Cambridge Archaeological Journal* 2(1):27-43.

Bednarik, Robert G. 2002 'The dating of rock art: a critique'. *Journal of Archaeological Science* 29(11):1213-1233.

Bednarik, Robert G. 'Ethnographic interpretation of rock art'. <<http://mc2.vicnet.net.au/home/interpret/web/ethno.html>> accessed 26 August 2005

Baker, Gwenda 2005 'Crossing boundaries: negotiated space and the construction of narratives of missionary incursion'. *Journal of Northern Territory History* 16:17-28.

Berndt, Roland Murray and Catherine Helen Berndt 1954 *Arnhem Land: Its History and its People*. F. W. Cheshire, Melbourne.

Bourke, Patricia 2000 *Late Holocene Indigenous economies of the tropical Australian coast: An archaeological study of the Darwin region*. Unpublished Doctoral thesis, Charles Darwin University, Darwin.

- Brockwell, Celia Jane, Robert Levitus, Jeremy Russel-Smith, and Peter Forrest 1995 'Aboriginal Heritage'. In T. Press, D. Lea, A. Webb, and A. Graham (eds) *Kakadu: Natural and Cultural Heritage Management*. ANCA and NARU, Darwin.
- Burningham, Nick 1994 'Aboriginal nautical art: a record of the Macassans and the pearling industry in the Northern Territory'. *The Great Circle* 16:139--151.
- Burningham, Nick 2000 'Sublime but not ridiculous: observations on the technical analysis of ships of first contact represented in various genre of art'. *Bulletin of the Australasian Institute for Maritime Archaeology* 24:63--70.
- Calley, Graham 1999 *The pumpkin settlements: agriculture and animals in Australia's first northern colonies*. Historical Society of the Northern Territory, Darwin.
- Chaloupka, George 1984 *From paleoart to casual paintings: the chronological sequence of Arnhem Land plateau rock art*. Northern Territory Museum of Arts and Sciences Monograph Series 1, Darwin.
- Chaloupka, George 1988 *Groote Eylandt Archipelago rock art survey 1988*. An unpublished report to the Heritage Branch, Conservation Commission of the Northern Territory, N.T. Government, Darwin.
- Chaloupka, George 1993 *Journey in Time: The 50,000 year story of the Australian Rock Art of Arnhem Land*. Reed Books Australia, Sydney.
- Chaloupka, George 1996 'Praus in Marege: Makassan subjects in Aboriginal rock art of Arnhem Land Northern Territory, Australia'. *Anthropologie* 2:131--142.
- Chippendale, Christopher and Paul S.C. Taçon 1998 'The many ways of dating Arnhem Land rock art, north Australia'. In C. Chippendale and P.S.C. Taçon (eds) *The archaeology of rock art*. Cambridge University Press, Cambridge pp.90--111.
- Clarke, Anne 1994 *Winds of Change: an archaeology of contact in the Groote Eylandt archipelago, Northern Australia*. Unpublished Doctoral thesis, Australian National University, Canberra.
- Clarke, Anne 2000a 'Time, tradition and transformations: The negotiation of cross-cultural engagements on Groote Eylandt, northern Australia'. In R. Torrence and A. Clarke (eds) *The archaeology of difference: Negotiating cross cultural engagements in Oceania*. Routledge, London pp.1--31.
- Clarke, Anne 2000b 'The moormans trowsers: Macassan and Aboriginal interactions and the changing fabric of Indigenous social life'. In S. O'Connor and P. Veth (eds) *East of the Wallace Line: Studies of past and present maritime cultures of the Indo-Pacific region*. AA Balkema, Rotterdam, pp.315--335.
- Clarke, Anne and Chris Johnston 2003 'Time, Memory, Place and Land: Social Meaning and Heritage Conservation in Australia'. In ICOMOS International Scientific Symposium *Place, memory, meaning: preserving intangible values in monuments and sites*.
- Clarke, Anne and Ursula Frederick 2006 'Closing the distance: interpreting cross-cultural engagements through Indigenous rock art'. In I. Lilley (ed.) *Archaeology in Oceania: Australia and the Pacific Islands*. Blackwell Publishing, Oxford pp.116--133.
- Clarke, Anne and Ursula Frederick 2008 'The mark of marvellous ideas: Groote Eylandt rock art and the performance of cross-cultural ideas'. In P. Veth, P. Sutton and M. Neale (eds) *Strangers on the shore: Early coastal contacts in Australia*. National Museum of Australia, Canberra pp.148--164.

- Clarke, Anne and Ursula Frederick 2011 'Making a sea change: Rock art, archaeology and the enduring legacy of Frederick McCarthy's research on Groote Eylandt'. In M. Thomas, and M. Neale (eds) *Exploring the legacy of the 1948 American-Australian scientific expedition to Arnhem Land*. ANU e-press, Canberra pp.135--155.
- Cole, Keith 1975 *A History of Oenpelli*. Nungalinga Publications, Winnellie.
- Cochrane, John, and Stuart Elliott 1998 *Military Aircraft Insignia of the World*. Airline Publishing, Shrewsbury.
- Cole, Keith 1980 *Seafarers of the Groote archipelago: Aborigines and mariners of the islands off Eastern Arnhem Land*. Keith Cole Publications, Bendigo.
- Dellino-Musgrave, Virginia 2006 *Maritime archaeology and social relations: British action in the southern hemisphere*. Springer Series in Underwater Archaeology 28.
- Dewar, Mickey 1992 *The "Black War" in Arnhem Land: Missionaries and the Yolngu 1908-1940*. Australian National University, North Australia Research Unit, Darwin.
- Dunn, Peter 2003 'A case of mistaken Identity during WW2' <<http://www.ozatwar.com/friendlyfire/mistakenidentity.htm>> Accessed 10 February 2013
- Edwards, Robert 1979 *Australian Aboriginal Art: The Art of the Alligator Rivers Region, Northern Territory*. Australian Institute of Aboriginal Studies, Canberra.
- Flood, Josephine 1997 *Rock art of the Dreamtime: images of ancient Australia*. Angus & Robertson, Sydney.
- Frederick, Ursula 1999 'At the centre of it all: Constructing contact through the rock art of Watarrka National Park, central Australia'. *Archaeology in Oceania* 34(3):132--144.
- Grey, Jeffery 1999 *A Military History of Australia*. Cambridge University Press, Melbourne.
- Gray, Geoffery 2006 'Stanner's War: WEH Stanner, the Pacific War, and its Aftermath'. *Journal of Pacific History* 41(2):145-163.
- Green, Jeremy 1990 *Maritime archaeology: A Technical Handbook*. Academic Press, London.
- Gunn, Robert G. 1988 *Rock Art in Kudjumarndi and Kukalak Areas - Western Arnhemland*. Unpublished Report to the Northern Land Council.
- Guse, Daryl 2008 *Urmarning Cultural Heritage Management Plan*. Unpublished Report for the Northern Land Council.
- Hall, Robert 1997 *The Black Diggers: Aborigines and Torres Strait Islanders in the Second World War*. Aboriginal Studies Press, Canberra.
- Harris John 1998 *Wish we'd done more: Ninety years of CMS and Aboriginal issues in north Australia*. Openbook Publishers, Adelaide.
- Hiscock, Peter 2008 *The Archaeology of Ancient Australia*. Routledge, London.
- Hodder, Ian 1998 'Creative Thought: A long-term perspective'. In S. Mithen (ed) *Creativity in Human Evolution And Prehistory*. Routledge, London pp.44-56
- King, Phillip Parker 1827 *Narrative of a Survey of the Intertropical and Western Coasts of Australia: performed between the years 1818 and 1822 Volume 1*. John Murray, London.

Lamilami, Lazarus 1974 *Lamilami Speaks: The Cry Went Up. A story of the people of Goulburn Islands, North Australia*. Ure Smith, Sydney.

Lape, Peter V., Sue O'Connor, and Nick Burningham 2007 'Rock Art: A Potential Source of Information about Past Maritime Technology in the South-East Asia-Pacific Region'. *International Journal of Nautical Archaeology* 36(2):238-253.

Layton, Robert 1992 *Australian Rock Art: A New Synthesis*. Cambridge University Press, Cambridge.

Levitus, Robert 1995 'Social history since colonisation'. In T. Press, D. Lea, A. Webb, and A. Graham (eds) *Kakadu: Natural and Cultural Heritage Management*. ANCA and NARU, Darwin.

McCarthy, Michael 2001 *Iron and Steamship Archaeology: Success and Failure on the SS Xantho*. Plenum Publishers, New York.

McIntosh, Ian S. 1996 'Islam and Australia's Aborigines? A perspective from north-east Arnhem Land'. *Journal of Religious History* 20(1):53-77.

McIntosh, Ian S. 1996 *Can We Be Equal in Your Eyes?: A perspective on reconciliation from north-east Arnhem Land*. Unpublished Doctoral thesis, Northern Territory University.

McIntosh, Ian S. 2006 'A treaty with the Macassans? Burrumarra and the Dholtji Ideal'. *The Asia Pacific Journal of Anthropology* 7(2):153-172.

McIntosh, Ian S. 2009 'Pre-Macassans at Dholtji? Exploring one of north-east Arnhem Land's great conundrums'. In P. Veth, P. Sutton and M. Neale (eds) *Strangers on the shore: Early coastal contacts in Australia*. National Museum of Australia, Canberra pp.165-180.

McKenzie, Maisie 1976 *Mission to Arnhem Land*. Rigby Limited, Sydney

McLean, Ian (ed) 2011 *How Aborigines invented the idea of contemporary art*. Institute of Modern Art and Power Publications, Brisbane and Sydney.

MacGillivray, John 1852 *Narrative of the Voyage of H.M.S. Rattlesnake, Commanded By the Late Captain Owen Stanley, R.N., F.R.S. Etc. During the Years 1846-1850*, Vol 2. T. & W. Boone, London

Macknight, Campbell 1976 *The voyage to Marege, Macassan Trepangers in Northern Australia*. Melbourne University Press, Melbourne.

Macknight, Campbell 2008 'Harvesting the memory: Open beaches in Makassar and Arnhem Land'. In P. Veth, P. Sutton and M. Neale (eds) *Strangers on the shore: Early coastal contacts in Australia*. National Museum of Australia, Canberra pp.133-147.

May, Sally K., Jennifer McKinnon and Jason Raupp 2009 'Boats on Bark: an Analysis of Groote Eylandt Aboriginal Bark-Paintings featuring Macassan Praus from the 1948 Arnhem Land Expedition, Northern Territory, Australia'. *International Journal of Nautical Archaeology* 38(2):369-385.

May, Sally K., Paul S.C. Taçon, Daryl Guse, and Megan Travers 2010 'Painting history: Indigenous observations and depictions of the 'other' in north western Arnhem Land, Australia'. *Australian Archaeology* 70:29-37.

May, Sally K., Paul S.C. Taçon and Michael Pearson 2011 'Painted ships on a painted landscape' In M. Thomas, and M. Neale (eds) *Exploring the legacy of the 1948*

American-Australian scientific expedition to Arnhem Land. ANU e-press, Canberra pp.1-23.

Mitchell, Scott 1994 *Culture Contact and Indigenous Economies on the Coburg Peninsula, North Western Arnhem Land*. Unpublished Doctoral thesis, Northern Territory University, Darwin.

Morphy, Howard 1991 *Ancestral Connections: Art and an Aboriginal system of Knowledge*. University of Chicago Press, Chicago.

Morphy, Howard 2003 *An anthropological report on the Yolngu People of Blue Mud Bay in relation to their claim to Native Title in the land and sea*. Unpublished Report for the Northern Land Council.

Morwood, Mike J. 2002 *Visions from the Past: The Archaeology of Australian Rock Art*. Allen and Unwin, Crows Nest.

Morphy, Howard and Francis Morphy 2006 'Tasting the Waters: Discriminating Identities in the Waters of Blue Mud Bay'. *Journal of Material Culture* 11(1-2):67-85.

Mountford, Charles P. 1956 *Art, Myth and Symbolism. Records of the American-Australian Scientific Expedition to Arnhem Land*. Melbourne University Press, Melbourne.

Mulvaney, John 2004 *Paddy Cahill of Oenpelli*. Aboriginal Studies Press, Canberra.

Northern Territory Times and Gazette 1917

Nottle A. G. 2007 'A grass fire on North Goulburn Island (309RS). In E. Simmonds and N. Smith (eds) *Radar Yarns: Being Memories and Stories Collected from Personnel who served in RAAF Ground Based Radar in World War II or a potpourri of people, places, problems and pleasures*. Radar Returns, Hampton p.106

O'Connell, John 1994 *HMAS Moresby 1925-1946*. Naval Historical Society of Australia Monograph No.38.

O'Connor, Sue and Steve Arrow 2008 'Boat images in the rock art of northern Australia with particular reference to the Kimberley, Western Australia'. In G. Clark, F. Leach, and S. O'Connor (eds) *Islands of inquiry: Colonisation, seafaring and the archaeology of maritime landscapes*. ANU ePress, Canberra pp.397-409.

Odgers, George 1982 *The Royal Australian Navy: An Illustrated History*. Child & Henry, Hornsby.

Porr, Martin and Hannah Rachel Bell 2012 'Rock-art', 'Animism' and Two-way Thinking: Towards a Complementary Epistemology in the Understanding of Material Culture and 'Rock-art' of Hunting and Gathering People'. *Journal of Archaeological Method and Theory* 19(1):161-205.

Peterson, Nicholas and Jeannie Devitt 1996 Report in support of a claim to recognition of Native Title in the sea by the Mangalarra, Mandilarri-Ildugij, Murran, Gadura, Mayarram, Minaga and Ngaynjaharr of the Croker Island Region. Unpublished Report to the Northern Land Council.

Powell, Alan 1982 *Far Country: A short history of the Northern Territory*. Melbourne University Press, Melbourne.

Rayner, Robert Joseph 2001 *Darwin and Northern Territory Force*. Rudder Press, Illawarra.

- Riseman, Noah Jed 2007 'Defending Whose Country? Yolngu and the Northern Territory Special Reconnaissance Unit in the Second World War'. *Limina: A Journal of Historical and Cultural Studies* 13:80-91
- Riseman, Noah Jed 2010 'Contesting White Knowledge: Yolngu Stories from World War II'. *Oral History Review* 37(2):170-190.
- Riseman, Noah Jed 2012a 'Rectifying 'the Great Australian Silence'? Creative representations of Australian Indigenous Second World War service'. *Australian Aboriginal Studies* 1:35-48
- Riseman, Noah Jed 2012b. *Defending Whose Country?: Indigenous Soldiers in the Pacific War*. University of Nebraska Press.
- Roberts, David Andrew 2004 'Nautical themes in the Aboriginal rock paintings of Mount Borradaile, western Arnhem Land'. *The Great Circle* 26(1):19--50.
- Roberts, David Andrew and Adrian Parker 2003 *Ancient Ochres: the Aboriginal Rock Paintings of Mount Borradaile*. J.B. Books, Marlestone.
- Russell, Denise 2004 Aboriginal-Makassan interactions in the eighteenth and nineteenth centuries in northern Australia and contemporary sea rights claims. *Australian Aboriginal Studies* 1(1):3-17.
- Ryan, Judith 1990 *Spirit in land: Bark paintings from Arnhem Land in the National Gallery of Victoria*. National Gallery of Victoria, Melbourne.
- Semaphore 2006 'The 'special cruise' of HMAS Gayundah 1911'. *Semaphore: Newsletter of Sea Power Centre of Australia* 10:1-2
- Saunders, Kay 1995 'Inequalities of sacrifice: Aboriginal and Torres Strait Islander labour in northern Australia during the Second World War'. *Labour History* 69:131-148.
- Searcy, Alfred 1912 *By Flood and Field: Adventures Ashore and Afloat in North Australia*. G. Bell & Sons, London.
- Skyscraper City Forum 2008 'Aboriginals trading internationally prior to White Australia?' <<http://www.skyscrapercity.com/showthread.php?t=712850>> Accessed 20 February 2013
- Stacey, Natasha 2007 *Boats to burn: Bajo fishing activity in the Australian fishing zone*. Asia Pacific Environment Monograph 2, ANU E Press.
- Staniforth, Mark and Michael Nash (eds) 2008. *Maritime Archaeology: Australian Approaches*. Springer Series in Underwater Archaeology, Springer, New York.
- Sutton, Peter 1988 'Responding to Aboriginal Art'. In P. Sutton (ed) *Dreamings: The Art of Aboriginal Australia*. Viking, New York pp 33-58
- Taçon, Paul.S.C., June Ross, Alistair Paterson and Sally K. May 2012 'Picturing Change and Changing Pictures: Contact Period Rock Art of Australia'. In J. McDonald, and P. Veth (eds.) *A Companion to Rock Art*. Wiley-Blackwell, pp420-436.
- Taçon, Paul.S.C., Sally K. May, Stuart Fallon, Megan Travers, Daryl Wesley and Ronald Lamilami 2010 'A minimum age for early depictions of southeast Asian praus in the rock art of Arnhem Land, Northern Territory'. *Australian Archaeology* 71:1-10.
- Taylor, Luke 1999 'Rainbows in the water: Western Arnhem Land, Northern Territory'. In L. Taylor (ed) *Painting the Land Story*. National Museum of Australia, Canberra pp33-52.

Thomson, Donald F. 1949 *Economic Structure and the Ceremonial Exchange Cycle in Arnhem Land*. Macmillan, Melbourne.

Trigger, David S. and Wendy Asche 2010 'Christianity, cultural change and the negotiation of rights in land and sea'. *The Australian Journal of Anthropology* 21(1):90-109.

Trudgen, Richard 2000 *Why warriors lie down and die: Towards an understanding of why the Aboriginal people of Arnhem Land face the greatest crisis in health and education since European contact*. DoctorZed Publishing, Darwin.

Turner, Derek Howard 1973 'The rock art of Bickerton Island in comparative perspective'. *Oceania* 43 (4):286--325.

Vahtrick Cyril 2007 'South Goulburn Island Mission'. In E. Simmonds and N. Smith (eds) *Radar Yarns: Being Memories and Stories Collected from Personnel who served in RAAF Ground Based Radar in World War II or a potpourri of people, places, problems and pleasantries*. Radar Returns, Hampton pp.113-114.

Warner, William Lloyd 1937 *A Black Civilization: A social study of an Australian tribe*. Harper and Brothers, New York.

Wesley, Daryl, Jennifer McKinnon and Jason Raupp 2012 'Sails Set in Stone: A Technological Analysis of Non-indigenous Watercraft Rock Art Paintings in North Western Arnhem Land'. *Journal of Maritime Archaeology*. 7(2):245-269.

Wiseman, Judith 1996 *Thomson Time, Arnhem Land in the 1930s: A photographic essay*. Museum of Victoria, Victoria.

Yunupingu, Djawa and Samantha Muller 2009 'Cross-cultural challenges for Indigenous sea country management in Australia'. *Australasian Journal of Environmental Management* 16(3):158-167.

## 9.0. CONCLUSION

This thesis has detailed the archaeology of coastal Macassan and Indigenous peoples in north western Arnhem Land. The investigations at the Malara trepang processing site at Anuru Bay and Indigenous archaeological sites in the Wellington Range hinterland have demonstrated the introduction of new technologies and significant shifts in rock art production which have been argued to reflect changes in residential mobility as a result of Indigenous engagement with Macassan and European economies. The Introduction and papers presented in body of the thesis have introduced the concept of the Indigenous hybrid economy and argued that this model provides an effective lens through which to view culture contact in northern Australia. The hybrid economies that developed in northern Australia between Indigenous peoples, Macassans, and Europeans likely facilitated the transmission of ideas and technology. Northern Australian Indigenous societies responded to encounters using customary knowledge, beliefs, and law and this in turn informed the basis of mediation and exchange in each new economic stage shown in Figure 13.

Early on, Indigenous people in the Anuru Bay and Wellington Range region displayed considerable ability to adapt and reorganise local economic and social strategies in response to culture contact generated from the Macassan trepang industry and followed by European market and state influences (Chapters 4, 6, 7, and 8; Appendices B, C, and D). The engagement with Macassans and later Europeans would have been preconditioned by earlier contacts with pre-Macassans, during which time Indigenous groups learnt about outsiders and developed customary ways to deal with visitors to their country (Chapter 2, Appendices D, and F).



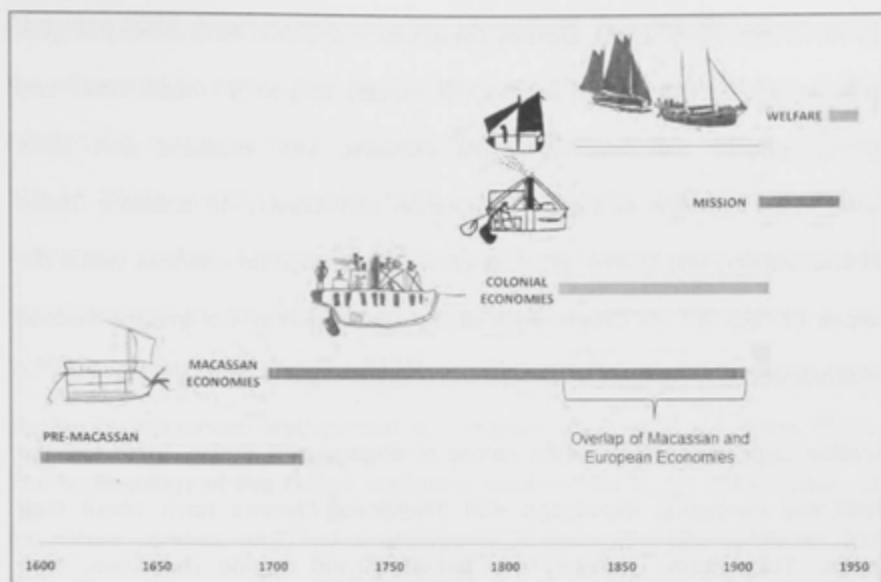


Figure 13. Five phase model of economic culture contact in north western Arnhem Land, Northern Territory.

The internalised changes and responses required by Indigenous society to facilitate their participation in the trepang industry and later European economies are perhaps the most significant to consider in concluding this thesis. According to Altman (2006), the customary sector of his hybrid economy model is significant in driving the individuality of Indigenous responses to each type of activity occurring within each state or market sector. For anthropologists, the responses that occur in contemporary Indigenous society engaging in market and state economies can be studied through consultation with Aboriginal informants. For archaeologists, only the material culture remains to inform us about how customary practice may have informed engagement. Mitchell (1994a) and Clarke (1994) have ably demonstrated how aspects of the archaeological record can inform on changes relating to Macassan and European contact. They argue that changes in diet, site selection, and site size were facilitated by changes in technology and mobility (Clarke 1994; Mitchell

1994a; 1994b, 1996; 2000). Despite the absence of actual marine technological items in the archaeological record (i.e., metal harpoons, ropes, sails and rigging, dugout canoes) the faunal remains, site locations and sizes demonstrate changes in marine exploitation and mobility. In addition, Clarke (2000a, 2000b) and Clarke and Frederick (2008) illustrate changes within the corpus of rock art on Groote Eylandt and analyse how the images encode information about the depth and meaning of cross-cultural interactions.

Another aspect pertinent to the nature of engagement during contact is the traditional ecological knowledge that Traditional Owners have about their estate. They know intimately the terrestrial and marine resources, their seasonal availability, and how best to access these resources in a timely and efficient manner. The incorporation of this customary knowledge and practice into the trepang industry may have meant that Macassan labour for trepang processing and harvesting would not need to be redirected towards provisioning. However, as Macknight (2013) has pointed out, we do not have contemporaneous accounts of Indigenous and Macassan cooperation. Despite there being numerous ethnographic accounts attesting to the fact that Aboriginal men worked on praus and assisted with trepang fishing and diving, and describing subsequent changes in social customs, these have mostly been recorded during later anthropological studies (c.f. Berndt and Berndt 1949; Clarke 1994; McIntosh 1996a, 1996b, 2006, 2008, 2011, 2013; Morphy 1991; Peterson 2003; Warner 1933, 1937). These accounts have also been criticised as perhaps being idealised versions of the past (Hiscock 2008; Hiscock and Faulkner 2008; Macknight 2011; Swain 1993). The Croker Island Native Title claim aptly demonstrated how difficult it was to provide evidence of this interaction in western Arnhem Land that would satisfy the Land Commissioner

(Peterson 2003; Strelein 2009). On the other hand, an important emphasis in the ethnographic record has always been on the 'two ways' nature of the relationship during successful periods of participation in the trepang industry (Clarke 2000a, 2000b; Lamilami 1974; McIntosh 1996a, 1996b, 2006, 2008). Indigenous control of access to traditional land and marine resources and the negotiation with the trepang industry was probably a unique circumstance in the Indigenous history of Australia as illustrated comparatively with various case studies of Indigenous engagement in European economies (c.f. Keen 2010). The archaeology of this culture contact is fundamental to the interpretation of the nature, conduct, and level of engagement between Indigenous people and Macassans.

Ethnographic evidence suggests major changes in Indigenous residence patterns following the establishment of Macassan campsites and later European settlements. Thomson (1949) and Berndt and Berndt (1954) argued that Yolngu trade and exchange was greatly influenced by the Macassan introduction of the dugout canoe and the draw of new commodities which encouraged residential shifts towards the coastline from interior regions producing later and more sedentary coastal settlements. Later, emerging European industries such as mining, pastoralism, and buffalo shooting saw Indigenous movement and settlement refocussed yet again around the areal hubs of these industries (Levitus 1995). The subsequent establishment of missions and other centres of European activity further accelerated aggregation into permanent settlements and fundamentally changed the nature of seasonal Indigenous mobility cycles (Baker 2005; Cole 1975; Dewar 1992; Harris 1998; Levitus 1995). Mitchell (1994a) and Clarke (1994) discuss the changes in residential mobility during successive phases of contact. Mitchell (1994b) suggested that the exchange

and movement of stone tools appeared to be amplified following the introduction of new trade materials from Macassans and later Europeans, and that the input of new materials may have in itself amplified existing trade and social networks.

The Wellington Range contains over ninety percent of all currently recorded Macassan-themed rock art imagery in western Arnhem Land (Chapter 6; Appendices B, C, and D). The archaeological evidence presented in this study has shown that the Wellington Range appears to be a nexus reflecting changes in the Indigenous exchange network that not only included objects but very likely involved the movement and aggregation of people as well (Chapter 4, 6, and 8; Appendix B, C, D). Within a short period of time, from the 17<sup>th</sup> century, Indigenous Traditional Owners had begun to modify their traditional residential patterns and intensify use of three key occupation complexes within the Wellington Range: Malarrak, Djulirri, and Maliwawa (Bald Rock) (Chapter 4; Appendix C, D). These sites were strategically located to form a residential base for Indigenous groups to interact with the local land owning group to negotiate access to pre-Macassan and Macassan materials and activities at the Anuru Bay Macassan trepang processing site. These sites continue to be used in a similar manner as a place of exchange for access to materials from the early European outposts on the Cobourg Peninsula (See Chapters 2, 4, 6, 7, Appendix D). All evince a proliferation in rock art production and the deposition of introduced contact materials from this period. When contact rock art and occupation is compared against the wider distribution of rock art motifs from the classic Freshwater Period (<1500 years BP), there is a strong contraction of focus to the large and strategically positioned complexes such as Malarrak, Djulirri, and Maliwawa (Bald Rock) (See Appendix C). Malarrak 1 and 4 also

show a significant increase in the intensity of occupation, reflected in the discard of stone artefacts, in the last 500 years.

During the 19<sup>th</sup> century, buffalo shooters operated on the East Alligator River, Cobourg Peninsula and King River areas (Chapter 7), and maritime economies such as trepang harvesting and pearling continued with increasing maritime shipping activity off the Arnhem Land coastline (Chapters 6; 7, and 8, Appendices B, C). Later in the 20<sup>th</sup> century the Wellington Range sites were still important as they formed an interconnection between the missions at Waruwi (South Goulburn Island), Gunbalanya (Oenpelli) and Minjalang (Croker Island) as the centres of state sponsored governance and welfare (Chapter 4 and 8). With the onset of Commonwealth governance, significant changes occurred marked by more sedentary occupation at these Aboriginal missions and welfare settlements. Although many traditional practices continued around these settlements (Lamilami 1974), the evidence of occupation in the Wellington Range becomes sporadic and then declines after World War II (Chapter 4, Chapter 8).

Here I propose that changes in local Indigenous cultures took place very rapidly in response to the high likelihood of pre-Macassan contact along the Arnhem Land coast. This preparation for encountering new peoples would have facilitated negotiations and Indigenous participation in the Macassan trepang industry intersecting customary and market forces. Following initial pre-Macassan contact Indigenous communities may have experienced a short period of instability as they reorganised their customary world view to take into account the new reality of outsiders. Individual Indigenous groups along the Arnhem Land coast would have needed to draw on the values of customary

activity as described by Altman (2001, 2006, 2007) in order to engage with the outsiders and new economies. However, Altman's (2001, 2006, 2007) hybrid economy model would predict that the new capital generated through participation in the trepang industry would strengthen customary practices such as trade and exchange, as argued by Mitchell (1994b), rather than diminishing customs and traditions. In this respect it is significant that the ethnographic evidence seems to indicate that many of the technologies and materials initially sought by Indigenous people from Macassans and Europeans were those that would benefit and strengthen traditional customs and practices (Chapter 7) (Berndt and Berndt 1949; Clarke 1994, 2000a, 2000b; Macknight 2011; McIntosh 1996a, 1996b, 2006, 2008, Mitchell 1994a; 1994b, 1996; 2000).

The archaeological remains from the three occupation complexes of Djulirri, Malarrak, and Maliwawa provide tangible evidence of the material capital generated via culture contact with Macassans and Europeans. It is represented by the presence of numerous introduced modified artefacts such as flaked glass, iron spears, iron hatchets and adzes, and the depiction of new technologies such as firearms in the rock art (Chapter 4, 6, 7). That ships are painted in x-ray style depicting not only the construction, but more importantly the cargo, illustrates that the origin and nature of these goods was not lost on Traditional Owners (Chapter 6; Appendices B, C, D).

In drawing on the hybrid economy model to examine Indigenous responses to culture contact, there are several major influences to consider. Figure 13 illustrates five phases of economic culture contact relevant to western Arnhem Land. As outlined in Chapter 2 and Appendices D and F, there is a high likelihood of a pre-Macassan contact phase in the Wellington Range preceding

the trepang industry and that supports the long culture contact model with South East Asia. The radiocarbon dates from Djulirri and Malara (Anuru Bay A) place this earlier phase of contact as beginning in the early to mid-1600s AD. The range of dates for site use suggests a 200 year duration for the Macassan economies, with an intensification of the industry after 1780 AD. This is followed by European colonial, mission, and then welfare settlement phases which brought a variety of economic pursuits to the region, as well as perpetuating existing ones (i.e. trepang fishing). Indigenous responses to each of these phases differed depending on the hybrid economy that developed, with resultant outcomes in terms of the transfer of technologies, goods, and knowledge.

The transfer of technology and goods are the easiest outcomes to identify in the archaeological record, directly or by proxy. Representations of pre-Macassan technology and goods in the archaeology of the Wellington Range are very limited. The presence of beads and rock art depictions of ships are the best indicators of potential pre-Macassan exchange and contact (see Chapter 4, Appendix D). A proxy for pre-Macassan contact and exchange may include the incorporation of design elements into rock art (Chapter 4). Macassan transfer of goods and technology has been demonstrated throughout the thesis and in previous research. In the Wellington Range the evidence for transfers of Macassan technology and goods is mostly demonstrated through the presence of glass artefacts, beads, and rock art (Chapters 4 and 6). The rock art of the Wellington Range does contain Macassan introduced imagery similar to that found on Groote Eylandt (Clarke 2000a; 2000b, 2002; Clarke and Frederick 2000). European transfer of technology and goods is overwhelmingly demonstrated in the Wellington Range archaeological artefact assemblages

and rock art. Chapters 4, 5, 6, 7, and 8 discuss the implications of introduced European material culture and imagery in the rock art. The transfer of firearms was not only just a material item or 'good' but was also represented a new technology (Chapter 7). Depictions of firearms in rock art further symbolised an incorporation of technology into an Indigenous customary space. The same can be stated for the depictions of many ships and maritime craft in the Wellington Ranges (Chapter 6 and 8; Appendices B, C, and D). The careful incorporation of introduced technology of European maritime vessels into rock art is an important reflection of the transfer of knowledge into indigenous customary practices and knowledge (Chapter 6 and 8). These transfers were all facilitated by a hybrid economy which varied depending on the intensity with which Indigenous people engaged each industry and sector.



## REFERENCES

- Adams, W.Y. and E.W. Adams, E.W. 2008. *Archaeological typology and practical reality: a dialectical approach to artifact classification and sorting*. Cambridge, Cambridge University Press.
- Adhuri D. S. 2013. Traditional and 'modern' trepang fisheries on the border of the Indonesian and Australian fishing zones. In *Macassan History and Heritage: Journeys, Encounters and Influences*. M. Clark and S. May (eds). pp183-204. Canberra, ANU E Press.
- Albrecht, G., C.R. McMahon, D. M. J. S. Bowman and C. J. A. Bradshaw. 2009. Convergence of Culture, Ecology, and Ethics: Management of Feral Swamp Buffalo in Northern Australia. *Journal of Agricultural and Environmental Ethics* 22(4):361-378.
- Allen, H. 1989. Late Pleistocene and Holocene settlement patterns and environment, Kakadu, Northern Territory, Australia. *Bulletin of the Indo-Pacific Prehistory Association* 9:92-117.
- Allen, H. and G. Barton. 1989. *Ngarradj Warde Djokeng: White Cockatoo Dreaming and the Prehistory of Kakadu, Northern Territory, Australia*. Sydney, Oceania Publications. Oceania Monograph 37.
- Austral Archaeology. 1993. Union Reefs Gold Project Archaeological Recording and Salvage of Historic Sites. Unpublished report for the Shell Company of Australia.
- Australian Human Rights Commission 2008. Accessed 7 September 2008. <[www.hreoc.gov.au/bth/additional\\_resources/bth\\_guide/tracing.html](http://www.hreoc.gov.au/bth/additional_resources/bth_guide/tracing.html)>
- Allen, J. 1972. Port Essington: a successful limpet port? *Historical Studies* 15(59):341-360.
- Allen J. 2008 *Port Essington: The Historical Archaeology of a North Australian Nineteenth Century Military Outpost*. Studies in Australasian Historical Archaeology 1. Sydney, University of Sydney Press.
- Altman, J.C. 2001. *Sustainable development options on Aboriginal land: the hybrid economy in the twenty-first century*. Canberra Centre for Aboriginal Economic Policy Research.
- Altman, J.C. 2003. People on country, healthy landscapes and sustainable Indigenous economic futures: The Arnhem Land case. The Drawing Board. *An Australian Review of Public Affairs* 4(2):65-82
- Altman, J.C. 2005 Development options on Aboriginal land: Sustainable Indigenous hybrid economies in the twenty-first century. In *The Power of*

*Knowledge, the Resonance of Tradition*. L. Taylor, G.K. Ward, G. Henderson, R. Davis and L.A. Wallis (eds). pp. 34-48. Canberra, Aboriginal Studies Press,

Altman, J.C. 2006 *In search of an outstations policy for Indigenous Australia*. Centre for Aboriginal Economic Policy Research, Australian National University. Canberra, CAEPR Working Paper 34.

Altman, J. 2009. The hybrid economy and anthropological engagements with policy discourse: A brief reflection. *The Australian Journal of Anthropology* 20(3):318-329.

Baker, G. 2005. Crossing boundaries: negotiated space and the construction of narratives of missionary incursion. *Journal of Northern Territory History* 16:17-28.

Bamforth, D.R. 1988. *Ecology and Human Organisation on the Great Plains*. New York, Plenum Press.

Barnes, R.H. 1995. Lamakera, Solor. Ethnohistory of a Muslim Whaling Village of Eastern Indonesia. *Anthropos* 90(4/6):497-509.

Bauer, F. H. 1964. *Historical geography of white settlement in part of the Northern Territory, Part 2, Katherine-Darwin region*. Divisional Report 64(1). Canberra, CSIRO Division of Land Research and Regional Survey.

Balme, J. and A. Paterson. 2006. *Archaeology in Practice: A Student Guide to Archaeological Analyses*. Malden, Blackwell Publishing.

Berndt R. M. and C. H. Berndt. 1954. *Arnhem Land: It's History and Its People*. Melbourne, F. W. Cheshire.

Berndt, R. M. And C. H. Berndt. 1996. *The World of the First Australians, Aboriginal Traditional Life: Past and Present*. Canberra, Aboriginal Studies Press.

Bird, M.I., C.S.M. Turney, L.K. Fifield, R. Jones, L.K. Ayliffe, A. Palmer, R. Cresswell, and S. Robertson. 2002. Radiocarbon analysis of the early archaeological site of Nauwalabila I, Arnhem Land, Australia: implications for sample suitability and stratigraphic integrity. *Quaternary Science Reviews* 21:1061-1075.

Bisson, M.S. 2000. Nineteenth Century Tools for Twenty-First Century Archaeology? Why the Middle Paleolithic Typology of François Bordes Must Be Replaced. *Journal of Archaeological Method and Theory* 7(1):1-48.

Blake, N.M., G. Wightman, and L. Williams. 1998. *Iwaidja ethnobotany: Aboriginal plant knowledge from Gurig National Park, northern Australia*. Darwin, Northern Territory Botanical Bulletin 23.

Bourke, P. 2000. Late Holocene Indigenous economies of the tropical Australian coast: an archaeological study of the Darwin Region. Unpublished PhD thesis, Department of Anthropology, Northern Territory University, Darwin.

Bowdler, S. 2002. Hunters and traders in northern Australia. Forager-traders in South and Southeast Asia: Long-term histories. In *Forager-Traders in South and Southeast Asia: Long-Term Histories*. K.D. Morrison and L.L. Junker (eds). pp.167–184. Cambridge: Cambridge University Press.

Brockwell, C.J., R. Levitus, J. Russel-Smith, and P. Forrest. 1995. Aboriginal Heritage. In *Kakadu: Natural and Cultural Heritage Management*. T. Press, D. Lea, A. Webb and A. Graham (eds). pp.15-63. Darwin, Australian Nature Conservation Agency and North Australia Research Unit.

Bulbeck, F.D. and B. Rowley 2001. Macassans and their pots in northern Australia. In *Altered States: Material Culture Transformations in the Arafura Region*. C. Fredericksen and I. Walters (eds). pp.55–74. Darwin, Charles Darwin University Press.

Burke, H and C. Smith. 2004. *The Archaeologists Field Handbook*. Sydney, Unwin and Allen.

Burningham, N. 1994. Aboriginal nautical art: a record of the Macassans and the pearling industry in northern Australia. *The Great Circle* 16(2):139-151

Burningham, N. 2000. Sublime but not ridiculous: observations on the technical analysis of ships of first contact represented in various genre of art. *Bulletin of the Australasian Institute for Maritime Archaeology* 24:63-70.

Chaloupka, G. 1974. Report of Site Survey Activities during 1973-74. Unpublished report to the Museum and Art Gallery of the Northern Territory.

Chaloupka, G. 1984. Chronological sequence of Arnhem Land Plateau Rock Art. In *Archaeological Research in Kakadu National Park*. R. Jones (ed). pp 291-298. Canberra: Australian National Parks and Wildlife Special Publication 13.

Chaloupka, G. 1993. *Journey in time: the world's longest continuing art tradition: the 50,000-year story of the Australian Aboriginal rock art of Arnhem Land*, Chatswood, Reed Publishing.

Chaloupka, G. 1996. Praus in Marege: Makassan subjects in Aboriginal rock art of Arnhem Land Northern Territory, Australia. *Anthropologie* 2:131-142.

Chippendale, C. and P.S.C. Taçon. 1998. The many ways of dating Arnhem Land rock art, north Australia. In *The Archaeology of Rock Art*. C. Chippendale and P.S.C. Taçon (eds.). pp. 90-111. Cambridge, Cambridge University Press.

Clark M. and S.K. May. 2013. Understanding the Macassans: A regional approach. In *Macassan History and Heritage: Journeys, Encounters and Influences*. M. Clark and S. May (eds.). pp1-8. Canberra: ANU EPress.

Clark, P. 2013. Dundee Beach Swivel Gun: Provenance Report. An unpublished report for Barbara Doukas and Christopher Doukas by the Museum and Art Gallery of the Northern Territory.

Clark, P. Monsoon traders lost on the Northern Australian coast – historical evidence for their existence. In *Asia-Pacific Regional Conference Underwater Cultural Heritage Proceedings*. M. Staniforth, J. Craig, S. C. Jago-on, B. Orillaneda. And L. Lacsina (eds). pp. 319-412. Manila, Asian Academy for Heritage Management.

Clarke, A. 1994. Winds of Change: an archaeology of contact in the Groote Eylandt archipelago, Northern Australia. Unpublished PhD Thesis, Australian National University.

Clarke, A. 2000a. Time, tradition and transformations: the negotiation of cross-cultural engagements on Groote Eylandt, northern Australia. In *The Archaeology of Difference Negotiating cross cultural engagements in Oceania*, R. Torrence and A. Clarke (eds). pp. 142-181. London, Routledge.

Clarke, A. 2000b. "The Moormans Trowsers": Macassan and Aboriginal interactions and the changing fabric of Indigenous social life. In *East of the Wallace Line: Studies of past and present maritime cultures of the Indo-Pacific region*. S. O'Connor and P. Veth (eds). pp.315-35. Rotterdam, AA Balkema.

Clarke, A. 2002. The Ideal and the Real: Cultural and Personal Transformations of Archaeological Research on Groote Eylandt, Northern Australia. *World Archaeology* 34(2):249-264.

Clarke, A. and U. Frederick. 2008. The mark of marvellous ideas: Groote Eylandt rock art and the performance of cross-cultural ideas. In *Strangers on the Shore: Early coastal contacts in Australia*. P. Veth, P. Sutton, and M. Neale. pp.148-164. Canberra, National Museum of Australia.

Clegg, J. 1983. Recording Prehistoric Art. In *Australian Field Archaeology: A Guide To Techniques*. G. Connah (ed). pp. 87-108. Canberra, Australian Institute of Aboriginal Studies.

Cole, Keith 1975 *A History of Oenpelli*. Winnellie, Nungalinga Publications.

Cundy, B.J. 1989. *Formal Variation in Australian Spear and Spearthrower Technology*. Oxford, BAR International Series 546.

David, B. 2002. Landscapes, rock art and the Dreaming: an archaeology of preunderstanding. London, Leicester University Press.

David, B. J., I. Brayer, I. McNiven, and A. Watchman. 2001. Why digital enhancement of rock paintings works: rescaling and saturating colours. *Antiquity* 75:781-792.

Davidson, I. 2013. Peopling the last new worlds: The first colonisation of Sahul and the Americas. *Quaternary international* 285:1-29.

Dewar, M. 1992. *The "Black War" in Arnhem Land: Missionaries and the Yolngu 1908-1940*. Darwin, Australian National University, North Australia Research Unit.

Dreyfus, M., and M. Dhulumburrk. 1980. Submission to Aboriginal Land Commissioner Regarding Control of Entry Onto Seas Adjoining Aboriginal Land in the Milingimbi, Crocodile Islands and Glyde River Area. Unpublished submission. Darwin, Northern Land Council.

Earl, G.W. 1846. *Enterprise, Discoveries and Adventures in Australia*. London, Madden and Malcolm.

Earl, G.W. 1854. *North Australia*. Sydney Morning Herald, Monday 10<sup>th</sup> April. pp.3-4.

Earl, G.W. 1863. *A Handbook for Colonists in Tropical Australia*. London, Royal Geographical Society.

Evans, N. 1992. Macassan loanwords in Top End languages. *Australian Journal of Linguistics* 12(1):45-91.

Evans, N. 2003. *Bininj Gun-wok: A pan-dialectal grammar of Mayali, Kunwinjku and Kune, Volume 1*. Canberra, Research School of Pacific and Asian Studies, Australian National University.

Faulkner, P. 2009. Focused, intense and long-term: evidence for granular ark (*Anadara granosa*) exploitation from late Holocene shell mounds of Blue Mud Bay, northern Australia. *Journal of Archaeological Science* 36(3):821-834.

Faulkner, P. 2013. *Life on the margins: an archaeological investigation of late Holocene economic variability, Blue Mud Bay, Northern Australia*, *Terra Australia* 38. Canberra, ANU E-Press.

Finlayson, C.M., B.J. Baily, W.J. Freeland and M.R. Fleming. 1988. Wetlands of the Northern Territory. In *The Conservation of Australian Wetlands*. Comb A.J. and P.S. Lake (Eds). pp.103-116. Chipping Norton, Surrey Beaty and Sons.

Gabriel, C. 2004. Introduction: seeing land from the sea. *World Archaeology* 35(3):323-328

Ganter, R. 2003. *China and the beginning of Australian history*. *The Great Circle* 25(1):3-19.

Ganter, R. 2006. Turning the map upside down. *History Compass* 4(1):26-35.

Ganter, R., J. Martinez, and G.M. Lee. 2006. *Mixed relations: Asian-Aboriginal contact in North Australia*. Crawley, University of Western Australia Press.

Grant, A. 1995. *Aliens in Arnhem Land*. Dee Why, Frontier Publishing.

Gunn, R.G. and R. Whear. 2007. The Jawoyn rock art and heritage project. *Rock Art Research* 24(1):5-20.

Guse, D. 1998. Archaeological survey of proposed PNC exploration work program, west Arnhem, Northern Territory EL 734, 5890, 5891. An unpublished report to the Northern Land Council.

Guse, D. 1999. Archaeological survey of proposed 1999 PNC Exploration Work Program, west Arnhem, Northern Territory: EL 734, 5890, 5891. An unpublished report for the Northern Land Council

Guse, D. 2006. Social Complexities, Repatriation, and the Nature of Indigenous Ancestral Skeletal Remains in Northern Australia. In *Crossing Cultures: Art, Politics and Identity*. S. Kleinert (ed). pp. 45-56. Darwin, Uniprint, Charles Darwin University.

Harris, J. 1998. *Wish we'd done more: Ninety years of CMS and Aboriginal issues in north Australia*. Adelaide, Openbook Publishers.

Harvey, M. 1999. Place Names and Land-Language Associations in the Western Top End. *Australian Journal of Linguistics* 19(2):161-195.

Hiscock, P. 1984. A preliminary report on the stone artefacts from Colless Creek Cave, Northwest Queensland. *Queensland Archaeological Research* 1:120-151.

Hiscock, P. 1989. Artefact recording in the field. In *Sites and bytes. Recording Aboriginal Places in Australia*. J. Flood, I. Johnson, and S. Sullivan (eds.). Pp.20-38. Australian Government Printing Service, Canberra.

Hiscock, P. 1993. Archaeological Investigations of the Wetlands of Kakadu National Park. An unpublished report to ANPWS. NTUAS 14.

Hiscock, P. 1997. Archaeological evidence for environmental change in Darwin Harbour. in *The marine flora and fauna of Darwin Harbour, Northern Territory, Australia. Proceedings of the Sixth International Marine Biological Workshop*. J.R. Hanley, G. Caswell, D. Megirian and H.K. Larson (eds). pp. 445-449. Darwin, Museum and Art Galleries of the Northern Territory and the Marine Sciences Association.

Hiscock, P. 1999. Holocene coastal occupation of Western Arnhem Land. In *Australian Coastal Archaeology*. J. Hall and I.J. McNiven (eds). pp. 91-103. Canberra, Department of Archaeology and Natural History, Australian National University.

Hiscock, P. 2008. *Archaeology of Ancient Australia*. London: Routledge.

Hiscock, Peter, 2011. Point production at Jimede 2, Western Arnhem Land. *Changing perspectives in Australian archaeology, part VI. Technical Reports of the Australian Museum* 23(6): 73-82.

Hiscock, P. and Mitchell, S. 1993. *Stone Artefact Quarries and Reduction Sites in Australia: Towards a Type Profile*. Technical Publications Series Number 4. Canberra, Australian Heritage Commission.

Hiscock, P. and P. Faulkner. 2006. Dating the Dreaming? Creation of Myths and Rituals for Mounds along the Northern Australian Coastline. *Cambridge Archaeological Journal* 16(2):209-222.

Holdaway, S. and N. Stern. 2004. *A Record in Stone: The Study of Australia's Flaked Stone Artefacts*. Canberra, Museum Victoria and AIATSIS.

Holmes, K. 1991 Report on the introductory stage of fieldwork at the Larrakeyah Rubbish Dump Site. Unpublished report to the National Trust Australia (NT), Darwin.

Howard, D. 1933. The English Activities of the North Coast of Australia in the First Half of the Nineteenth Century. *Proceedings of the Royal Geographical Society of Australasia, South Australian Branch* 33:21-194.

Jochim, M.A. 1979. Breaking Down the System: Recent Ecological Approaches in Archaeology. In *Advances in Archaeological Method and Theory* Vol. 2. M. Schiffer (ed.), pp. 77-117. New York, Academic Press.,

Johnson, H. and L. Mayoux. 1998. Investigation as Empowerment: Using Participatory Methods. In *Finding Out Fast: Investigating Skills for Policy Development*. A. Thomas, J. Chataway and M. Wuyts (eds.), pp 141-71. London: Sage.

Johnson, I. 1979. The Getting of Data. A Case Study from the Recent Industries of Australia. PhD thesis, Australian National University, Canberra.

Johnson, I. 1980. Bytes from sites: The design of an excavation data recording system. In *Holier than thou: Proceedings of the 1978 Kioloa Conference on Australian Prehistory*. I. Johnson (ed.), pp. 91-118. Canberra, Department of Prehistory, Research School of Pacific and Asian Studies, Australian National University.

Jones, R. 1985. *Archaeological Research in Kakadu National Park*. Australian National Parks and Wildlife Special Publications Volume 13. Canberra, Australian National Parks and Wildlife.

Kamminga, J. 1982. *Over the Edge: Functional analysis of Australian stone tools. Occasional Papers in Anthropology No 12*. St. Lucia, Anthropology Museum, University of Queensland

Kamminga, J., and H. Allen. 1973. *Report of the archaeological survey: Alligator Rivers Environmental Fact-Finding Study*. Darwin, Government Printer.

Keen, I. 2010. *Indigenous Participation in Australian Economies: Historical and Anthropological Perspectives*. Canberra, ANU E Press.

Kelly, R.L. 1983. Hunter-Gatherer Mobility Strategies. *Journal of Anthropological Research* 39: 277-306.

Kian, K.H. 2006. *The political economy of Java's northeast coast, c. 1740-1800: elite synergy. TANAP monographs on the history of the Asian-European interaction Volume 3*. Leiden, Koninklijke Brill NV.

- King, P. P. 1827. *Narrative of a Survey of the Intertropical and Western Coasts of Australia: performed between the years 1818 and 1822 Volume 1*. London, John Murray.
- Knaap, G. and H. Sutherland 2004. *Monsoon Traders, Ships, Skippers and Commodities in Eighteenth-Century Makassar*. Leiden: KITLV Press.
- Lamilami, L. 1974. *Lamilami Speaks: The Cry Went Up. A Story of the People of Goulburn Islands, North Australia*. Sydney, Ure Smith.
- Langford-Smith, T. 1978. A Select Review of Silcrete Research in Australia. In *Silcrete in Australia*. T. Langford-Smith (ed), pp. 1-11. Armidale, University of New England Press.
- Levitus, R. 1995. Social history since colonisation. In *Kakadu: Natural and Cultural Heritage Management*. T. Press, D. Lea, A. Webb, and A. Graham (eds), pp. 64-93. Darwin, ANCA and NARU.
- Macgillivray, J. 1852. *Narrative of the Voyage of H.M.S. Rattlesnake, Commanded By the Late Captain Owen Stanley, R.N., F.R.S. Etc. During the Years 1846-1850. Volume 2*. Adelaide, Libraries Board of South Australia.
- Macknight, C.C. 1969. The Macassans: A study of the early trepang industry along the Northern Territory coast. Unpublished PhD thesis, Australian National University.
- Macknight, C.C. 1976. *The Voyage to Marege. Macassan trepangers in northern Australia*. Melbourne: Melbourne University Press.
- MacKnight, C.C. 1986. Macassans and the Aboriginal Past. *Archaeology in Oceania*, 21:69-75.
- MacKnight, C.C. 2008. Harvesting the memory: Open beaches in Makassar and Arnhem Land. In *Strangers on the Shore: Early coastal contacts in Australia*. P. Veth, P. Sutton, and M. Neale (eds.), pp. 133-147. Canberra, National Museum of Australia.
- Macknight, C.C. 2011. 'The view from Marege': Australian knowledge of Makassar and the impact of the trepang industry across two centuries. *Aboriginal History* 35:121-143.
- Macknight, C.C. 2013. Studying trepangers. In *Macassan History and Heritage: Journeys, Encounters and Influences*. M. Clark and S. May (eds), pp. 19-40. Canberra: ANU E Press.
- Maynard, L. 1977. Classification and terminology in Australian rock art. In *Form in Indigenous Art*. P. J. Ucko (ed.), pp. 387-402. London, Gerald Duckworth and Co. Ltd.
- McCarthy F.D. 1976. *Australian Aboriginal Stone Implements*. Sydney, Australian Museum Trust.



- McCarthy, J. 1986. Pine Creek Heritage Zone Archaeological Survey. An unpublished report to the National Trust of Australia (NT), Darwin.
- McConvell, P. 1990. The Linguistic Prehistory of Australia: Opportunities for Dialogue with Archaeology. *Australian Archaeology* 31:3-27.
- McGrail, S. 2004. *Boats of the World: From the Stone Age to Medieval Times*. Oxford: Oxford University Press.
- McIntosh, I. S. 1996a. Can We Be Equal in Your Eyes? A perspective on reconciliation from north-east Arnhem Land. Unpublished PhD Thesis, Department of Anthropology, Northern Territory University.
- McIntosh, I.S. 1996b. Islam and Australia's Aborigines? A perspective from north-east Arnhem Land. *Journal of Religious History* 20(1):53-77.
- McIntosh, I. S., 2006. A treaty with the Macassans? Burrumarra and the Dholtji Ideal. *The Asia Pacific Journal of Anthropology* 7(2):153-172.
- McIntosh, I.S. 2008 Pre-Macassans at Dholtji? Exploring one of north-east Arnhem Land's great conundrums. In *Strangers on the Shore: Early coastal contacts in Australia*. P. Veth, P. Sutton, and M. Neale (eds.), pp. 165-180. Canberra, National Museum of Australia,
- McIntosh, I.S. 2011. Missing the Revolution! Negotiating disclosure on the pre-Macassans (Bayini). In *North-East Arnhem Land. In Exploring the Legacy of the 1948 Arnhem Land Expedition*. M. Thomas and M. Neale (eds.), pp. 337-354. Canberra, ANU E-Press.
- McIntosh, I.S. 2013. Unbirri's pre-Macassan legacy, or how the Yolngu became black. In *Macassan History and Heritage: Journeys, Encounters and Influences*. M. Clark and S. May (eds), pp. 95-105. Canberra, ANU E Press.
- McIntosh, Ian. 2014. The ancient African coins of Arnhem Land. *Australasian Science* 35(4):19-21.
- McNiven, I.J. and L. Russell. 2002. Ritual response: place marking and the colonial frontier in Australia. In *Inscribed Landscapes: Marking And Making Place*. B. David and M. Wilson (eds), pp 27-37. Honolulu, University of Hawai'i Press.
- Meehan B 1982 *Shell bed to Shell Midden*. Canberra, Australian Institute of Aboriginal Studies.
- Mitchell, S. 1994a. Culture Contact and Indigenous Economies on the Coburg Peninsula, Northwestern Arnhem Land. Unpublished PhD thesis, Department of Anthropology, Northern Territory University.
- Mitchell, S. 1994b. Stone exchange network in north-western Arnhem Land: Evidence for recent chronological change. In *Archaeology in the North: Proceedings of the 1993 Australian Archaeological Conference*. M. Sullivan, S. Brockwell, and A. Webb (eds), pp. 188-200. Darwin, Northern Australian Research Unit.

Mitchell, S. 1994c. An Archaeological and Historical Survey of Selected Mining Sites in the Pine Creek District, Northern Territory. Unpublished report to the National Trust of Australia (NT Branch).

Mitchell, S. 1996. Dugongs and dugouts, sharpbacks and shellbacks: Macassan contact and Aboriginal marine hunting on the Coburg Peninsula, north-western Arnhemland. *Bulletin of the Indo-Pacific Prehistory Association, Chiang-Mai Papers* 2(15):181-191.

Mitchell, S. 2000. Guns or barter? Indigenous exchange networks and the mediation of conflict in post-contact western Arnhem Land. In *The Archaeology of Difference. Negotiating Cross-Cultural Engagements*. R. Torrence and A. Clarke's (eds.), pp. 182-214. Hoboken, Routledge.

Morris, J. 2010. The Japanese and the Aborigines: An Overview of the Efforts to Stop the Prostitution of Coastal and Island Women. *Journal of Northern Territory History* 21:15-36.

Morphy, H. 1991. *Ancestral Connections: Art and an Aboriginal System of Knowledge*. Chicago, University of Chicago Press.

Mottana, A., R. Crespi and G. Liborio. 1978. Guide to Rocks and Minerals. New York, Simon and Schuster.

Mulvaney, J. 2004. *Paddy Cahill of Oenpelli*. Canberra, Aboriginal Studies Press.

Mulvaney, J and N. Green. 1992. *Commandant of Solitude: The Journals of Captain Collet Barker 1829-1831*. Melbourne, Melbourne University Press.

Mulvaney, J. n.d. Mulvaney Reflections, Anuru Bay Northern Territory. <<http://www.deepeninghistories.anu.edu.au/sites/mulvaney-reflections/index.php?action=gallery&subject=Anuru%20Bay,%20Northern%20Territory&gpslocs=>> Accessed 20 April 2014.

Needham R.S. 1984. *Alligator Rivers, Northern Territory. 1:250,000 Geological Series Explanatory Notes*. Department of National Resources, Bureau of Mineral Resources, Geology and Geophysics. Australian Government Publishing Service.

NRETAS. 2007a. *Western Arnhem Plateau*. Department of Natural Resources, Environment, the Arts, and Sport. Darwin, Northern Territory Government.

NRETAS. 2007b. *Arnhem Coast*. Department of Natural Resources, Environment, the Arts, and Sport. Darwin, Northern Territory Government.

O'Connell, J.F. and J. Allen. 2004. Dating the colonization of Sahul (Pleistocene Australia-New Guinea): a review of recent research. *Journal of Archaeological Science* 31:835-853.

Pellant, C. 1992. Rocks and Minerals. New York, DK Publishing.

- Peterson, N. 2003. *On the visibility of Indigenous Australian systems of marine tenure*. <http://digitalcollections.anu.edu.au/handle/1885/41649> (Accessed 21/02/2006)
- Pough, F. H. 1988. *A Field Guide to Rocks and Minerals* (5th Ed). Boston, Houghton Mifflin Company.
- Powell A. 1988. *Far Country: A Short History of the Northern Territory*. Carlton, Melbourne University Press.
- Roberts, A. 1994. Cultural landmarks: The Milingimbi mounds. In *Archaeology in the North: Proceedings of the 1993 Australian Archaeological Conference*. M. Sullivan, S. Brockwell, and A. Webb (eds), pp. 176-87. Darwin, North Australian Research Unit, Australian National University.
- Roberts, D. A. 2004. Nautical themes in the Aboriginal rock paintings of Mount Borradaile, western Arnhem Land. *The Great Circle* 26(1):19-50.
- Roberts, D.A. and A. Parker. 2003. *Ancient Ochres: The Aboriginal Rock Paintings of Mount Borradaile*. J Marlestone, B. Books Australia.
- Roberts, R.G., R. Jones, and M.A. Smith. 1990. Thermoluminescence dating of a 50,000-year-old human occupation site in northern Australia. *Nature* 345:153-156.
- Robinson, C. and D. Mercer. 2000. Reconciliation in troubled waters? Australian oceans policy and offshore native title rights. *Marine Policy* 24(4):349-360.
- Rosenfeld, A. and C. Smith. 1997. Recent developments in radiocarbon and stylistic methods of dating rock-art. *Antiquity* 71(272):405-411.
- Rowley, B. 1997. *The Makassar Connection: A descriptive analysis and comparison of Macassan and Makassar earthenwares*. Unpublished BA Honours Thesis, Department of Archaeology. Perth: University of Western Australia.
- Russell, D. 2004 Aboriginal-Makassan in the eighteenth and nineteenth centuries in northern Australia and contemporary sea rights claims. *Australian Aboriginal Studies* 1:3-17
- Schrire, C. 1982 *The Alligator Rivers: Prehistory and Ecology in Western Arnhem Land*. *Terra Australis* 7. Department of Prehistory, Research School of Pacific Studies, Australian National University.
- Schwerdtner Máñez, K. and S.C.A. Ferse 2010. The history of Makassan trepang fishing and trade. *PloS one* 5(6)e11346:1-8.
- Senior B.R. and Smart P.G. 1976 *Coburg Peninsula – Melville Island, Northern Territory 1:250,000 Geological Series Explanatory Notes*. Department of National Resources, Bureau of Mineral Resources, Geology and Geophysics. Australian Government Publishing Service.

Singer, R. 2006. Expression of Information Structure in Mawng: Intonation and Focus. In *Selected Papers from the 2005 Conference of the Australian Linguistic Society*. K. Allan (ed), pp:3-14.

Singer, R. 2010a. Mawng lexicalised agreement in typological perspective. In *Rara and Rarissima: Documenting the fringes of linguistic diversity*. J. Wohlgemuth and M. Cysouw (eds), pp. 325-340. Berlin, New York, Walter De Gruyter.

Singer, R. 2010b. Creativity in the use of gender agreement in Mawng: How the discourse functions of a gender system can approach those of a classifier system. *Studies in Language* 34:2:382-415

Singer, R. 2012. Do nominal classifiers mediate selectional restrictions? An investigation of the function of semantically based nominal classifiers in Mawng (Iwaidjan, Australian). *Linguistics* 50(5):955-990.

Spyer, P. 1997. The eroticism of debt: pearl divers, traders, and sea wives in the Aru Islands, eastern Indonesia. *American Ethnologist* 24(3):515-538.

Stein, G.J. 2002. From Passive Periphery to Active Agents: Emerging Perspectives in the Archaeology of Interregional Interaction. *American Anthropologist* 104(3):903-916.

Steinberg, D. 2006. The Boustead Jar: A Possible Portuguese Connection to North Australia. *Newsletter of the Australasian Society for Historical Archaeology Inc.* 36(4):8-10.

Steward, J.H. 1938. *Basin-Plateau Aboriginal Sociopolitical Groups*. Smithsonian Institution, Bureau of American Ethnology Bulletin 120. Washington, United States Government Printing Office.

Steward, J.H. 1977. The Concept and Method of Cultural Ecology. In *Evolution and Ecology: Essays on Social Transformation*. J. H. Steward, J.C. Steward and R.F. Murphy (eds), pp. 43 -57. Urbana, University of Illinois Press.

Strelein, L. 2009. Native Title Offshore: Commonwealth v Yarmirr. In *Compromised Jurisprudence: Native Title Cases since Mabo*. L. Strelein (ed), pp. 49-54. Canberra, Aboriginal Studies.

Sutherland, H. 2000. Trepang and wangkang; The China trade of eighteenth-century Makassar c.1720s-1840s. In *Authority and enterprise among the peoples of South Sulawesi*. Tol, R., K. van Dijk and G. Acciaoli (eds.), pp. 451-472. Leiden: KITLV Press.

Swain, T. 1993 *A Place for Strangers: Towards a history of Australian Aboriginal being*. Cambridge University Press, Cambridge.

Sweet, I.P., A.T. Brakel, and L. Carson. 1999. The Kombolgie Subgroup - a new look at an old 'formation'. *AGSO Research Newsletter* 30:26-28.

Taçon, P.S.C. and S. Brockwell. 1995. Arnhem Land prehistory in landscape, stone and paint. *Antiquity* 69(265):676-695.

Terrell, J.E. and K.O. Pope. 2008. Environmental setting of human migrations in the circum-Pacific region. *Journal of Biogeography* 35:1-21.

The Commonwealth of Australia v. Yarmirr and Others 2001. 208 C.L.R. 1, 85

Thomas, D.H. 1973. An Empirical Test for Steward's Model of Great Basin Settlement Patterns. *American Antiquity* 38:155-176.

Thomas, D.H. 1989. Diversity in hunter-gatherer cultural geography. In *Quantifying Diversity In Archaeology*. R.D. Leonard and G.T. Jones (eds), pp. 85-91. Cambridge, Cambridge University Press.

Thomson, D.F. 1949. *Economic structure and the ceremonial exchange cycle in Arnhem Land*. Melbourne, MacMillan and Co.

Thorpe, R. and G. Brown. 1990. *The Field Description of Igneous Rocks*. Buckingham: Open University Press.

Tindale, N.B. 1925. Natives of Groote Eylandt and of the west coast of the Gulf of Carpentaria. *Records of the South Australian Museum* 3: 61-102.

Tonnaer, A. 2002. The Resounding of a Plane Crash: The Aeroplane Dance and Its Implications in the Social Context of Contemporary Aboriginal Life in Borrooloola. Unpublished Masters Arts Thesis. Nijmegen, Radboud University.

Toohey, J. 1981. Alligator Rivers Stage II Land Claim. Office of the Aboriginal Land Commissioner. Canberra, Australian Government Publishing Service.

Trudgen, R. 2000. *Why warriors lie down and die: Towards an understanding of why the Aboriginal people of Arnhem Land face the greatest crisis in health and education since European contact*. Darwin, DoctorZed Publishing.

Turner, N.J., I.J. Davidson-Hunt, and M. O'Flaherty. 2003. Living on the Edge: Ecological and Cultural Edges as Sources of Diversity for Social-Ecological Resilience. *Human Ecology* 31(3):440-461.

Tuwo, A. 2012. The Bugis-Makassarese: from Farmers to Seafarers. Unpublished presentation at the Macassan history and heritage: Building understandings of journeys, encounters and influences Symposium, Institute for Professional Practice in Heritage and the Arts, College of Social Sciences, The Australian National University.

Ulm, S. 2006. Australian Marine Reservoir Effects: A Guide to  $\Delta R$  Values. *Australian Archaeology* 63:57-60.

Vickers, A. 1987. Hinduism and Islam in Indonesia: Bali and the Pasisir World. *Indonesia*, 44:31-58.

Walters, I. 1999. First Austronesian contacts with mainland Southeast Asia and northern Australia. *Bulletin of Australian Institute for Maritime Archaeology* 24:77-84.

- Warner, W. 1932. Malay Influence on Aboriginal Cultures of North-eastern Arnhem Land. *Oceania* 2:476-495.
- Warner, W.L. 1937. *A black civilization: a social study of an Australian tribe*. New York, Harper and Brothers.
- Watson-Andaya, B. 2006. Oceans Unbounded: Transversing Asia across "Area Studies". *The Journal of Asian Studies* 65(4):669-690.
- Webb, T.T. 1938. *Spears to Spades*. Sydney, Spectator Publishers.
- Wells, S. 2003 Negotiating Place in Colonial Darwin Interactions between Aborigines and Whites, 1869–1911. Unpublished PhD thesis, Faculty of Humanities and Social Sciences, University of Technology, Sydney.
- Willan, R. and M. Dredge. 2004. *Molluscs in National Oceans Office Description of Key Species Groups in the Northern Planning Area*. Hobart, National Oceans Office.
- Wilson, B., 2002 *A Handbook to Australian Seashells on Seashores East to West and North to South*. Sydney, Reed New Holland.
- Wilson, B.A., P.S. Brocklehurst, M.J. Clark, and K.J.M. Dickinson. 1990. *Vegetation Survey of the Northern Territory, Australia*. Technical Report Number 49. Palmerston, Conservation Commission of the Northern Territory.
- Woinarski, J. and B. Baker. 2002. Biodiversity Audit – bioregional case study. Tiwi-Coburg bioregion, Northern Territory. Unpublished report to the National Land and Water Audit, Parks and Wildlife Commission of the Northern Territory.
- Woinarski, J., Beggs, K., Hempel, C., Price, O. and A. Fisher. 2002b. Ironwood: an ecological summary. In Ironwood *Erythrophleum chlorostachys* in the Northern Territory: aspects of its ecology in relation to timber harvesting. R. Taylor (ed), pp. 10-21. A report to Agriculture, Fisheries and Forestry, Australia.
- Woinarski, J., Beggs, K., Hempel, C., Price, O. and A. Fisher. 2002c. Distribution and biomass of ironwood in the Northern Territory. In Ironwood *Erythrophleum chlorostachys* in the Northern Territory: aspects of its ecology in relation to timber harvesting. R. Taylor (ed), pp. 22-68. A report to Agriculture, Fisheries and Forestry, Australia.
- Woinarski, J.C.Z., C. Hempel, I. Cowie, K. Brennan, R. Kerrigan, G. Leach, and J. Russell-Smith. 2006. Distributional patterns of plant species endemic to the Northern Territory, Australia. *Australian Journal of Botany* 54:627-640.
- Woinarski, J. C., J. Russell-Smith, A. N. Andersen, and K. Brennan. 2009. Fire management and biodiversity of the western Arnhem Land Plateau. In *Culture, Ecology and Economy of Fire Management in North Australian Savannas: Rekindling the Wurrk Tradition*. P. Cooke, J. Russell-Smith, and P. Whitehead (eds), pp. 201-227. Collingwood, CSIRO Publishing.

**Appendix A**

A. McKinnon, J., D. Wesley, J.T. Raupp and I. Moffat 2013 Geophysical investigations at the Anuru Bay trepang site: A new approach to locating Macassan archaeological sites in Northern Australia. *Bulletin of the Australasian Institute for Maritime Archaeology* 37: 106–112.

## Geophysical investigations at the Anuru Bay trepang site: A new approach to locating Macassan archaeological sites in Northern Australia

Jennifer F. McKinnon\*

Department of Archaeology, Flinders University, GPO Box 2100, ADELAIDE, SA 5001, Australia.

Email: jennifer.mckinnon@flinders.edu.au

Daryl Wesley

Archaeology and Natural History, School of Culture, History and Language, College of Asia and the Pacific, Australia

National University, ACTON, ACT 2601, Australia.

Jason T. Raupp

Department of Archaeology, Flinders University, GPO Box 2100, ADELAIDE, SA 5001, Australia.

Ian Moffat

Department of Archaeology, Flinders University, GPO Box 2100, ADELAIDE, SA 5001, Australia and Research School of Earth Sciences, Australian National University, ACTON, ACT, 0200, Australia.

\*Corresponding author

### Introduction

This paper presents the results of a magnetometer survey and initial archaeological excavations of Macassan and Indigenous features conducted at the Anuru Bay Macassan trepang processing site. The archaeology of this area is complex, containing both material reflecting the Indigenous utilisation of coastal resources and the periodic visits of the Macassan trepangers from Indonesia.

Despite a history of archaeological investigations on Macassan period sites (i.e. Clarke 1994; McKnight 1976; Mitchell 1994), geophysical survey has not previously been applied as part of these investigations. While Macassan sites may contain features amenable to conventional archaeological geophysics (such as iron trepang processing pots), additional potential exists for the application of magnetometry to locate features created through burning, as has been applied to Australian Indigenous sites (Bonhomme and Stanley 1985; Fanning *et al.* 2009; Moffat *et al.* 2008 & 2010; Stanley & Green 1976; Wallis *et al.* 2008) and international Indigenous sites (Abbot & Frederick 1990; Batt & Dockrill 1998; Jones & Munson 2005). The results of this study demonstrate that this approach is equally applicable to Macassan sites, opening up a new and potentially fruitful avenue for exploring the archaeology of this trade system.

### Background to the Study Area

Anuru Bay is a shallow coastal embayment in northwest Arnhem Land. The peninsula consists of a northern facing open sandy beach. The southern side of the peninsula, where the Macassan site is located, was formerly a sandy beach but is now characterised by extensive mangrove vegetation. Vegetation on the peninsula consists of sparse dune vegetation with *Eucalyptus miniata* (Darwin Woolly Butt), *Eucalyptus tetradonta* (Stringybark) open forests with Sorghum grassland understorey and coastal mangrove forests.

The region is dominated by the massive sandstone escarpments of Mamadawerre Sandstone, part of the Kombolgie Subgroup (Carson *et al.* 1999; Rawlings 1999),



Figure 1. Anuru Bay site location.

that had a major influence on the coastal geomorphology of the region. The Anuru Bay area mostly comprises Quaternary regolith consisting of sand, silt, carbonate sediment and ferruginous laterite, the distribution of which reflects the complex environmental evolution of the area since the Pleistocene sea level rise stabilisation circa 6000 to 8000 BP (Needham 1984; Senior & Smart 1976; Sweet *et al.* 1999). The coastal and estuarine plains are developed mainly on estuarine sediments deposited in drowned river valleys and embayments that are seasonally inundated during annual wet season.

A wide variety of Indigenous archaeological sites exist in the north-western Arnhem Land region including rockshelter occupation sites, rock art sites, artefact scatters, stone and ochre quarry sources, stone arrangements, and coastal shell middens and scatters. The earliest archaeological evidence for occupation of north-west Arnhem Land has been dated to at least  $31\,620 \pm 350$  calBP (R32137/3) based on radiocarbon dates from excavations of an Indigenous rockshelter in the Wellington Range.

Indigenous coastal resource extraction is well-





Figure 2. Aerial photograph of Anuru Bay (D. Wesley).

documented through a number of ethnographic and archaeological investigations along the Northern Territory coastal regions (Bourke 2000; Brockwell 2001; Meehan 1982; Mitchell 1994; Mowat 1994 & 1995). The majority of the Indigenous population of Arnhem Land was concentrated along the coastline to take advantage of the abundant local resources, which also provided one of the major routes for communication and interaction with other clan groups (Morphy 1991: 40). Shell species consumed in this region are diverse and abundant (Meehan 1982) and the archaeological evidence of this activity is likewise common and varied in nature (Clarke 1994; Bourke 2000; Roberts 1994). According to Davis (1985), Indigenous peoples have continued to use a diverse range of ecological resources, especially from the sea.

The Anuru Bay complex of Macassan archaeological features attests to a lengthy period of repeated occupation and possibly large numbers of Macassan trepangers (Macknight 1969 & 1976). Previous investigation of the Anuru Bay Macassan trepang processing site by Macknight (1969 & 1976) documented a range of archaeological features associated with this marine extraction industry. Such features include 21 stonelines used for the boiling of trepang (some of which are now buried) running in a south-south westerly to north-north easterly direction. The stonelines are formed as single lines of stacked ferruginous sandstone rocks, with small bays for fire pits and scattered pieces of Macassan material culture including fragments of glass, ceramic, iron, brass and clay pipes. This site was likely abandoned by the Macassans by 1909 (Burningham 2000: 64; May *et al.* 2009: 370), and possibly much earlier as no record of it exists in official documentation (i.e. Searcy 1909).

#### The Macassan trade in the Northern Territory

Macassans voyaged to northeast Arnhem Land from Sulawesi in Indonesia in search of edible holothurians, commonly known as trepang or sea cucumbers (Schwerdtner Mäñez & Ferse 2010). These annual visits to the north coast of Australia occurred over the last few centuries (c. 1700) until Australian government

intervention stopped the Macassans in 1906. These visits had a profound impact on Indigenous culture and society (Mulvaney & Kamminga 1999) as reflected in the Indigenous archaeological record (Chaloupka 1993: 192). Three major trepang processing sites have been documented in the Northern Territory: Anuru Bay, Lyaba and Entrance Bay (Macknight 1976: 98).

Macassan occupation of the Arnhem Land coastline has been described as episodic, with voyagers taking advantage of the northwest monsoon winds in late December to reach Australia before returning to Indonesia with the southeast trade winds in March. Macknight (1976) estimates that this annual trade heightened during the nineteenth century, possibly involving between 30 and 60 *praus* (watercraft), each with an average crew of 30.

Macassans were known to establish trepang processing encampments along the Arnhem Land coastline to use as local base camps. These camps consisted of linear stone hearths for processing trepang via boiling in large pots. Trepang was then 'cured' by burying it in sand to decalcify it, and drying and smoking it in bamboo sheds (Pearson 2005: 49). Living arrangements for the workers at these processing sites consisted of building elevated wooden structures utilising materials from their *praus* (Macintosh 1996 & 2006). A ubiquitous archaeological feature of these sites is the linear 'stonelines' that provided a base for multiple trepang pot boiling. Several archaeologists have recorded evidence of these visits across northern Australia (see Clarke 1994, 2000a & 2000b; Clarke & Frederick, 2006; Macknight 1969, 1972, 1976 & 1986; May *et al.* 2009: 370; Mitchell 1994 & 2000; Mulvaney 1975 & 1989).

#### Magnetometry in archaeology

Geophysical techniques are widely used and have made considerable contributions to archaeological investigations worldwide (Clarke 1990; Weymouth 1986), although they have been only sporadically applied within Australia (Lowe 2012). Geophysical techniques can locate buried material, reveal site formation processes and define site boundaries (Witten 2006). Coastal areas of Arnhem Land such as Anuru Bay contain multiple periods of occupation and use through Indigenous camps and shell middens, Macassan resource extraction sites including trepang boiling stations, and sites of European activities. Magnetometry has great potential in such archaeological contexts due to its ability to detect areas of burning or heating, waste disposal, and industrial activities (Batt & Dockrill 1998; Frederick & Abbott 1992; Moffat *et al.* 2008, 2010 & 2011; Slater *et al.* 2000; Wallis *et al.* 2008).

The targets most amenable to geophysical investigation at the Anuru Bay site are areas of increased magnetism caused by cultural episodes of intense burning. The mechanism for anthropogenic burning causing magnetic enhancement of iron rich material through increased thermoremanence and the creation of more magnetically susceptible minerals has been extensively summarised elsewhere (i.e. Clark 1990; Aspinall *et al.* 2008). The



Figure 3. Magnetometer survey in progress (D. Wesley).

creation of a magnetic signature in this way has been validated by extensive control experiments (Carrancho & Villalain 2011; Gose 2000; Linford & Canti 2001; Mclean & Kean 1993) suggesting that this is a robust strategy for archaeological prospection. While widespread anthropogenic burning of the landscape as a resource management strategy is practised in Northern Australia (i.e. Jones 1969), the increase in magnetic intensity accompanying hearths and campfires is likely to be higher (Belamo 1993; Linford & Canti 2001) and so these features will be distinctive.

Anthropogenic enhancement of the magnetism at the Anuru Bay site could include Indigenous and Macassan living spaces (i.e. hearths), industrial processing areas (i.e. smokehouse depressions, trepang boiling areas) and discarded ferrous objects (i.e. pots, axes, knives).

#### Methodology

Geophysical investigations were conducted using a Geometrics G-856 single sensor proton precession magnetometer with data collected on a regular grid with 2 m line and station spacing in areas of the Anuru Bay site. Grid locations within this local grid were determined by stretching fibreglass measuring tapes between points on opposite ends of two baselines. These positions were relocated using measuring tapes for excavation, meaning that accurately locating them with RTK GPS or total station during survey was unnecessary. No diurnal correction was applied to the magnetometer data. Three surveys were conducted over the area including two 30 m by 30 m areas and one 60 m by 14 m area. All surveys were oriented on a north-south axis (x axis) by east-west axis (y axis). The data from these surveys were combined and further processed in Microsoft Excel to remove erroneous points where magnetic gradient was too high for robust results, gridded and presented as a contour plot using MagPick software.

#### Results

The magnetometer data showed a number of both discrete and diffuse anomalies that correlate to anthropogenic features known and investigated through previous and

Anuru Bay Magnetometer Survey

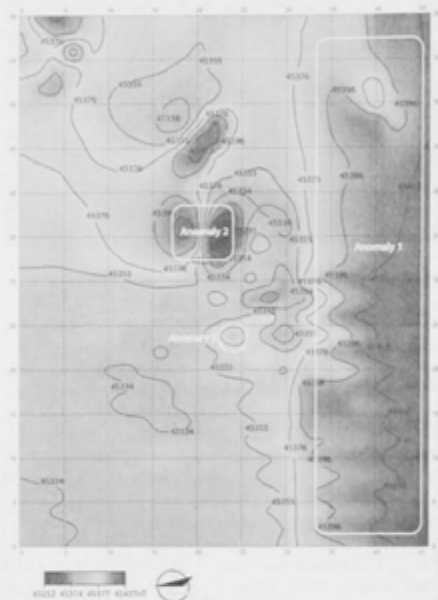


Figure 4. Map of magnetometer survey and magnetic anomalies (J. McKinnon).

subsequent excavation (see Frederick & Abbott 1992 for a discussion on anomaly types). The most distinct is a monopolar anomaly (Anomaly 1) located on the southern edge of the survey area. This anomaly continues with a relatively lower signature and more diffuse boundary towards the eastern edge of the survey area. North of Anomaly 1 is a low magnetic intensity dipolar anomaly (Anomaly 2). West of Anomaly 2 is a slightly higher intensity and more discrete dipolar anomaly (Anomaly 3). These anomalies were selected for direct investigation on the basis of having the largest variation in nT value from background and not corresponding to features visible on the ground surface. Several other dipole anomalies exist including approximately 10 m to the east of Anomaly 2 and approximately 25 m to the north east of Anomaly 2, which correspond to isolated ferruginous sandstone on the surface and may reflect anthropogenic or weathering processes.

#### Direct investigation of geophysical anomalies

The distribution of Anomaly 1 coincides with a visible but discontinuous stoneline made of highly burnt ferruginised sandstone. Within this feature, a test pit revealed stratigraphic units that consisted of dark, organic-rich, sandy silty soil, which is charcoal-rich with ashy lenses

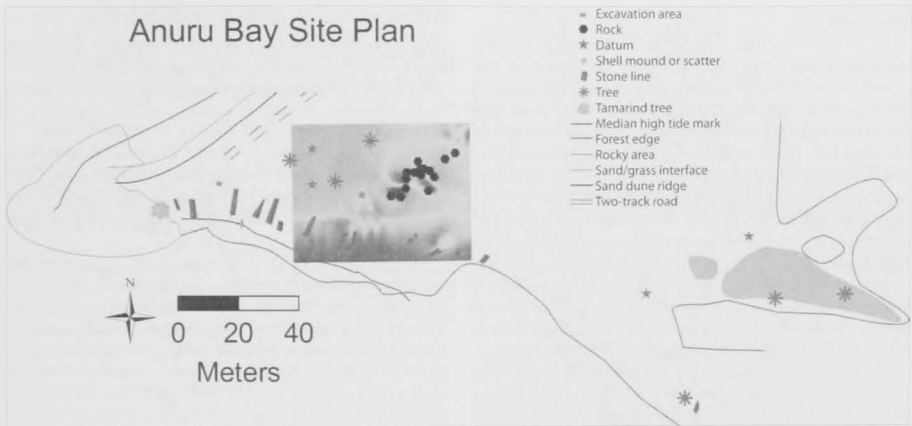


Figure 5. Site plan of Anuru Bay with magnetometer survey data overlay (J. McKinnon after J. Fenner).

and interspersed with shell throughout. Earthenware potsherds were also interspersed throughout the unit.

Anomaly 2, located to the north of the stonelines, was investigated by means of excavation. A 50 cm by 50 cm trench (T2) was emplaced on the anomaly. T2 was excavated to sterile soil and no significant anthropogenic features were identified during the excavation.

A stronger dipolar anomaly, Anomaly 3, located to the west of Anomaly 2 was also investigated by means of excavation. Anomaly 3 is located on top of the chenier ridge above the complex of stonelines and in an area of the Anuru Bay site complex that was subjected to limited investigation by Macknight (1976). A trench was opened at Anomaly 3, (T1-SQ1) to investigate the sub-surface deposit. The square revealed a densely packed shell midden layer immediately below the ground surface. The midden layer continued for 20 cm in depth and produced approximately 15 kg of shell. This midden layer contained the highest diversity and abundance of shell species from

all of the trenches eventually excavated at Anuru Bay. The shell material was highly burnt and friable with ashy lenses interspersed throughout the deposit. At the base of the shell midden layer, a heat retainer hearth feature was found comprising five claystone rocks. The stones were deep red in colour indicating that they had undergone significant heating. Kaolinitic claystone in the Northern Territory will change colour from heat treatment owing to the presence of high levels of iron oxides.

The trench revealed three major stratigraphic units (Table 1). Samples for radiocarbon dating were collected at the base of the shell midden layer above the culturally sterile unit SU-III (Table 1). The calibrated basal date range, based on the SHCal 04 Southern Hemisphere calibration curve (McCormac *et al.* 2004), for the start of the midden accumulation is 1170–980. Therefore evidence for Indigenous occupation of the peninsula predates the known Macassan occupation by approximately 800 to 1000 years.



Figure 6. Intact stoneline in the survey area (Photo: D. Wesley).



Figure 7. Heat retainer hearth feature (Photo: D. Wesley).

## Discussion

The linear nature of Anomaly 1, the strong correspondence with the surface distribution of the stonelines and the lack of any other significant features during excavation suggests that this feature is caused by the presence of the stonelines. These results suggest the material has been subjected to anthropogenic firing, which has converted hematite and/or goethite emplaced during the laterisation process (i.e. Tardy & Nahon 1985) to maghemite or magnetite. The enhancement of the magnetic response of this stoneline is most likely due to its interpreted post construction use as a base for multiple trepanning or boiling. The 'sawtooth' nature of the northern boundary of this feature is attributed to operator error during survey, due to the regular offset of 2 m on each survey line, which is coincident with the station spacing.

Anomaly 1 depreciates in value towards the east. This reduction in magnetic signature may suggest a reduction of the density of the stones comprising the stonelines, or their dispersal and hence disruption of magnetic orientation (Bevan 1994; Moffat *et al.* 2011) due to post use disturbance.

The lack of a subsurface cause for Anomaly 2 is puzzling, however, it may be explained by the abundant rocks present in a haphazard arrangement trending northeast-southwest from the location of this feature to the northeast corner of the survey area. If these features are indeed the cause of this magnetic anomaly, they have likely been anthropogenically fired either by Macassans, Indigenous or post-contact inhabitants.

The enhanced magnetism of Anomaly 3 is interpreted to be the results of the hearth and/or the burning of shell in this area. The comparative small spatial extent of this anomaly suggests that the hearth is a more likely candidate for causing this feature.

Of further interest, from this survey is the comparatively high level of magnetic enhancement (approximately 50 nT) of the features compared to other similar Australian surveys (i.e. Moffat *et al.* 2008 & 2010; Wallis *et al.* 2008). This may be explained by the abundant non-magnetic iron oxides present due to weathering processes in Northern Australia, which are amenable for conversion to magnetic features through firing, suggesting that this area would be profitable for future surveys of this kind.

The magnetometer survey methodology used in this investigation, in which the relatively slow sampling rate proton precession sensor (one sample every three seconds for robust results) (Geometric Inc. 2007) and manual positioning were applied, proved suitable for defining features within a known site. This methodology is, however, probably too slow both in magnetometer sample rate and survey grid setup for the location of unidentified archaeological sites. The Arnhem Land coast is several thousand kilometres long, sparsely populated and an area potentially rich in archaeological heritage so techniques for rapidly locating new sites is of great interest. Further reconnaissance surveying for locating new sites would achieve results using a combined cesium vapour sensor (ten samples per second) (Geometrics Inc. 2001) and

RTK-DGPS methodology (as outlined in Moffat *et al.* in prep.) which allows the operator to collect a density of data points while moving at an uninterrupted walking pace and does not require a site to be gridded with survey tapes.

## Conclusion

Despite extensive survey of the location of Macassan trepanning sites in northern Australia (i.e. MacKnight 1976) many questions remain in regards to the nature of the relationship between Indigenous occupants and Macassan visitors at these sites.

The results of a magnetometer survey at an Indigenous/Macassan archaeological site at Anuru Bay have been presented here in which the magnetometer survey located a number of significant anomalies, one of which was demonstrated to be a Macassan stoneline and another an Indigenous pre-Macassan hearth and burnt shell midden dated to 1170-980 calBP. The survey also located a number of isolated rocks, which appear to have been magnetically enhanced by firing.

Our results demonstrate that magnetic enhancement is an intrinsic component of Macassan and Indigenous sites in this region and so geophysical surveys can make a significant contribution to locating a range of buried features with minimal disturbance. While in this survey some archaeological features such as the stonelines were present on the surface, many Macassan sites likely remain buried on the extensive Arnhem Land coastline and may be located using geophysical techniques.

## Acknowledgements

This research was undertaken by funding provided by Flinders University's Programme in Maritime Archaeology and the Australian Research Council Linkage grant (LP0882985). The authors would like to acknowledge the following people for their assistance in the fieldwork and preparation of this paper: Traditional Owner Ronald Lamilami for permission to undertake the field work and use the information for this paper; field data was collected with assistance from Toni Massey and Jack Fenner; fieldwork was facilitated by Ian White, Northern Land Council and the Jabiru Regional Office; and additional assistance in the field was kindly provided by the Office of the Supervising Scientist, NRETAS, and Bushfires Council of the Northern Territory. The authors would also like to thank the *Bulletin's* editors and anonymous reviewers, whose comments were invaluable to the clarity of this work.

## References

- Abbott, J.T. and Frederick, C.D., 1990, Proton magnetometer investigations of burned rock middens in west-central Texas: Clues to formation processes. *Journal of Archaeological Science* 17: 535-545.
- Aitken, M.J., Webster, G. and Rees, A., 1958, Magnetic prospecting. *Antiquity* 32: 270-271.
- Aspinall, A., Goffney, C. and Schmidt, A., 2008, *Magnetometry for archaeologists*. Altamira, Lanham.
- Barr, C.M. and Dockrill, S.J., 1998, Magnetic moments in prehistory: Integrating magnetic measurements with

- other archaeological data from the Seattles multiperiod settlement. *Archaeological Prospection* 5: 217-227.
- Bevan, B.W., 1994, The magnetic anomaly of a brick foundation. *Archaeological Prospection* 1.2: 93-102.
- Bonhomme, T. and Stanley, J., 1985, Magnetic mapping of prehistoric aboriginal fireplaces at Bunda Lake, Belarabon Station, Western New South Wales. *Australian Archaeology* 21: 63-73.
- Bourke, P., 2000, Late Holocene Indigenous economies of the tropical Australian coast: An archaeological study of the Darwin Region. Unpublished PhD Thesis, Northern Territory University.
- Brockwell, S., 2001, Archaeological settlement patterns and mobility strategies on the lower Adelaide River, Northern Australia. Unpublished PhD Thesis, Department of Anthropology, Northern Territory University.
- Burningham, N., 2000, Sublime but not ridiculous: Observations on the technical analysis of ships of first contact represented in various genre of art. *Bulletin of the Australasian Institute for Maritime Archaeology* 24: 63-70.
- Carson, L.J., Haines, P.W., Brakel, A., Pietsch, B.A. and Ferenczi, P.A., 1999, Milngimbi SD532, 1:250000 geological map series explanatory notes. Northern Territory Geological Survey: 46.
- Carrancho, A. and Villalain, J.J., 2011, Different mechanisms of magnetisation recorded in experimental fires: Archaeomagnetic implications. *Earth and Planetary Science Letters* 312.1 & 2: 176-187.
- Clark, A., 1990, *Seeing beneath the soil: Prospecting methods in archaeology*. B.T. Batsford Ltd, London.
- Clarke, A., 1994, Winds of Change: An archaeology of contact in the Groote Eylandt archipelago, Northern Australia. Unpublished PhD Thesis, Department of Archaeology and Natural History, Research School of the Pacific and Asian Studies, Australian National University.
- Clarke, A., 2000a, Time, tradition and transformation: The negotiation of cross-cultural engagements in Groote Eylandt, Northern Australia. In: R. Torrence and A. Clarke (eds.), *The archaeology of difference: Negotiating cross-cultural engagements in Oceania*. Routledge, London: 142-181.
- Clarke, A., 2000b, The moorman's trousers: Aboriginal and Macassan interactions and the changing fabric of Indigenous social life. In: S. O'Connor and P. Veth (eds.), *East of Wallace's Line: Studies of past and present maritime cultures of the Indo-Pacific Region*. Modern Quaternary Research in Southeast Asia, 16. Balkema, Rotterdam: 315-335.
- Clarke, A. and Frederick, U., 2006, Closing the distance: Interpreting cross-cultural engagements through Indigenous rock art. In: I. Lilley (ed.), *Archaeology of Oceania: Australia and the Pacific Islands*. Blackwell, Oxford: 116-133.
- Chaloupka, G., 1993, *Journey in time: The 50,000 year story of the Australian Aboriginal rock art of Arnhem Land*. Reed Books, Chatswood.
- Davis, S., 1985, Aboriginal tenure of the sea in northern Arnhem Land. In: F. Gray and I. Zann (eds.) Workshop Series 8: Traditional knowledge of the marine environment in northern Australia. Proceedings of a Workshop held in Townsville, Australia, 29 and 30 July 1985. Great Barrier Reef Marine Park Authority and Commonwealth Department of Primary Industry.
- Fanning, P.C., Holdaway, S.J. and Phillips, R.S., 2009, Heat-retainer hearth identification as a component of archaeological survey in western NSW, Australia. In: A. Fairburn, S. O'Connor and B. Marwick (eds.), *New directions in archaeological science*, Terra Australis 28. Australian National University, Canberra: 13-23.
- Frederick, C.D. and Abbott, J.T., 1992, Magnetic prospection of prehistoric sites in an alluvial environment: Examples from NW and West-Central Texas. *Journal of Field Archaeology* 19.2: 139-153.
- Geometrics Inc., 2001, Operation Manual: G-858 Magnamapper, Unpublished Operations Manual: 107.
- Geometrics Inc., 2007, Operations Manual: G-856AX Memory-Mag Proton Precession Magnetometer. Unpublished Operations Manual: 55.
- Gove, W.A., 2000, Palaeomagnetic studies of burned rocks. *Journal of Archaeological Science* 27: 409-421.
- Jones, R., 1969, Firestick farming. *Australian Natural History* 16: 224-231.
- Jones, G. and G. Munson, 2005, Geophysical survey as an approach to the ephemeral campsite problem: Case studies from the northern plains. *Plains Anthropology* 50.193: 31-43.
- Linford, N.T. and Canti, M.G., 2001, Geophysical evidence for fires in antiquity: Preliminary results from an experimental study. *Archaeological Prospection* 5.3: 128-138.
- Le Borgne, E., 1955, Susceptibilité magnétique anormale du sol superficiel. *Annales de Géophysique* 11: 399-419.
- Lowe, K.M., 2012, Review of geophysical applications. *Australian Archaeology* 74: 71-84.
- MacKnight, C.C., 1969, The Macassans. Unpublished PhD Thesis, Department of Archaeology and Natural History, Australian National University.
- MacKnight, C.C., 1972, Macassans and Aborigines. *Oceania* 42: 283-319.
- MacKnight, C.C., 1976, *The voyage to Marege: Macassan trepangers in Northern Australia*. Melbourne University Press, Melbourne.
- MacKnight, C.C., 1986, Macassans and the Aboriginal past. *Archaeology in Oceania* 21: 69-75.
- Marmet, E., Bina, M., Fedoroff, N. and Tabbagh, A., 1999, Relationships between human activity and the magnetic properties of soils: A case study in the medieval site of Roissy-en-France. *Archaeological Prospection* 6: 161-170.
- May, S.K., McKinnon, J.F. and Raupp, J.T., 2009, Boats on bark: An analysis of Groote Eylandt Aboriginal bark-paintings featuring Macassan praus from the 1918 Arnhem Land Exhibition, Northern Territory, Australia. *International Journal of Nautical Archaeology* 38.2: 369-385.
- Meehan, B., 1982, *Shell bed to shell midden*. Australian Institute of Aboriginal Studies, Canberra.
- McCormac, F.G., Hogg, A.G., Blackwell, P.G., Buck, C.E., Higham, T.F.G. and Reimer, P.J., 2004, ShCal04 Southern Hemisphere Calibration 0-11.0 cal kyr BP. *Radiocarbon* 46: 1087-1092.
- McIntosh, L.S., 1996, Can we be equal in your eyes? A perspective on reconciliation from north-east Arnhem Land. Unpublished PhD Thesis, Department of Anthropology, Northern Territory University.
- McIntosh, L.S., 2006, A treaty with the Macassans? Borrumarra and the Dholji Ideal. *The Asia Pacific Journal of Anthropology* 7.2: 153-172.
- McLean, R.G. and Kean, W.F., 1993, Contributions of wood ash magnetism to archaeomagnetic properties of fire pits and hearths. *Earth and Planetary Science Letters* 119: 387-394.
- Mitchell, S., 1994, Culture contact and Indigenous economies on the Cobourg Peninsula, Northwestern Arnhem Land. Unpublished PhD Thesis, Department of Anthropology, Northern Territory University.
- Mitchell, S., 2000, Guns or barter? Indigenous exchange networks and the mediation of conflict in post-contact western Arnhem Land. In: R. Torrence and A. Clarke (eds.), *The archaeology of difference: Negotiating cross-cultural engagements*. Routledge, London.
- Moffat, L., Wallis, L.A., Beale, A. and Kynuna, D., 2008, Applications of geophysical techniques for the detection

- and identification of open Indigenous sites in Australia: A case study from inland northwest Queensland. *Australian Archaeology* 66: 60–64.
- Moffat, I., Wallis, L.A., Hounslow, M., Niland, K., Domett, K. and Trevorrow, G., 2010. Geophysical prospecting for Late Holocene burials in coastal environments: Possibilities and problems from a pilot study in South Australia. *Geoschaeology: An International Journal* 25.5: 645–665.
- Moffat, I., David, B., Barker, B., Kuaso, A., Skelliff, R. and Arahio, N., 2011. Magnetometer surveys in archaeological research in Papua New Guinea: Keveoki I, Gulf Province. *Archaeology in Oceania* 46.1: 17–22.
- Moffat, I., Gorman, A., Koch, R. and Garnant, J., (in prep.). Reconnaissance magnetometer investigations of the former Orroral Valley Tracking Station. *Journal of Cultural Heritage*.
- Morphy, H., 1991. *Ancestral connections: Art and an Aboriginal system of knowledge*. University of Chicago Press, Chicago.
- Mowat, F., 1994. Size really does matter: Factors affecting shell size fragmentation. In: M. Sullivan, S. Brockwell and A. Webb (eds.), *Archaeology in the North: Proceedings of the 1997 Australian Archaeological Association Conference Darwin*. Australian National University, Canberra.
- Mowat, F., 1995. Variability in Western Arnhem Land shell midden deposits. Unpublished MA Thesis, Department of Anthropology, Northern Territory University.
- Muhawney, D.J. and Kammings, J., 1999. *Prehistory of Australia*. Smithsonian Institution Press, Washington.
- Muhawney, D.J., 1975. *The Prehistory of Australia*. Penguin Books, Melbourne.
- Muhawney, D.J., 1989. *Encounters in place. Outsiders and Aboriginal Australians 1606–1985*. University of Queensland Press, St Lucia.
- Needham, R.S., 1984. Alligator River, Northern Territory; 1:250 000 Geological Series. Bureau of Mineral Resources, Geology and Geophysics Australia, Explanatory Notes, SD 53–1.
- Pearson, M., 2005. *Great southern land: The maritime exploration of Terra Australis*. National Capital Printing, Canberra.
- Rawlings, D.J., 1999. Stratigraphic resolution of a multiphase intracratonic basin system: The McArthur Basin, northern Australia. *Australian Journal of Earth Sciences* 46.5: 703–723.
- Roberts, A., 1994. Cultural landmarks: The Milingimbi mounds. In: M. Sullivan, S. Brockwell and A. Webb, (eds.), *Archaeology in the North. Archaeology in the North: Proceedings of the 1997 Australian Archaeological Association Conference Darwin*. Australian National University, Canberra: 176–87.
- Schwerdtner Maier, K. and S.C.A. Ferse, 2010. *The history of Makassan trepang fishing and trade*. PLoS ONE, 5(6), e11346.
- Schmidt, A., 2007. Archaeology, magnetic methods. In: D. Gubbins and E. Herrero-Bervera (eds.) *Encyclopedia of Geomagnetism and Paleomagnetism*. Springer, Dordrecht: 23–31.
- Searcy, A., 1909. *In Australian tropics*. George Robertson and Co., London.
- Senior, B.R. and Smart, P.G., 1976. Cobourg Peninsula-Melville Island, Northern Territory, 1:250 000 Geological Series explanatory notes. Bureau of Mineral Resources, Australia 1v. SC/53-13 & SC/52-16.
- Slater, L.A., Hamilton, N.D., Sandberg, A. and Jankowski, M., 2000. Magnetic prospecting at a prehistoric settlement in Main. *Archaeological Prospection* 7: 31–41.
- Stanley, J.M. and Green, R., 1976. Ultra-rapid magnetic surveying in archaeology. *Geosurveying* 14: 51–56.
- Sweet, I.P., Brakel, A.T., Rawlings, D.J., Haines, P.W., Plumb, K.A. and Wygralak, A.S., 1999. Mount Marumba, Northern Territory, 1: 250 000 Geological Series explanatory notes. Bureau of Mineral Resources, Australia 1v. SD 53–6.
- Tardy, Y. and Nahon, D., 1985. Geochemistry of laterites, stability of Al-goethite, Al-hematite, and Fe<sup>3+</sup>-kaolinite in bauxites and ferricretes: An approach to the mechanism of concretions formation. *American Journal of Science* 285: 865–903.
- Tauxe, L., 2002. *Paleomagnetism: principles and practice*. Kluwer Academic Publishers, Dordrecht.
- Wallis, L.A., Moffat, I., Trevorrow, G. and Massey, T., 2008. Archaeological geophysics in the Indigenous reburial process: A case study from Ngarrindjeri ruse, South Australia. *Antiquity* 82: 750–760.
- Waymouth, J.W., 1986. Geophysical methods of archaeological site surveying. In: M. Schiffer (ed), *Advances in archaeological method and theory* 9. Academic Press, New York: 311–395.
- Witten, A.J., 2006. *Handbook of geophysics and archaeology*. Equinox Publishing, London.

Appendix B

A. May S. K., P. S. C. Taçon, D. Wesley and M. Pearson 2014 Painted ships on a painted Arnhem Land landscape. The Great Circle 35(2)81-100.

## PAINTED SHIPS ON A PAINTED ARNHEM LAND LANDSCAPE

Sally K. May (1), Paul S.C. Taçon (2), Daryl Wesley (3) and Michael Pearson (4)

- (1) School of Archaeology and Anthropology & Rock Art Research Centre, The Australian National University, Canberra, ACT 2601 (E-mail: sally.may@anu.edu.au).
- (2) PERAHU, School of Humanities, Gold Coast campus, Griffith University, Queensland (E-mail: p.tacon@griffith.edu.au).
- (3) Department of Archaeology and Natural History, The Australian National University, Canberra, ACT 0200 Australia (E-mail: Daryl.wesley@bigpond.com).
- (4) Institute for Professional Practice in Heritage and the Arts, The Australian National University, Canberra, ACT 0200 (E-mail: mike.p@ozemail.com.au).

### Introduction

Australian Aboriginal and Torres Strait Islander rock art is an extraordinary pictorial record of life in the north of Australia, often hailed as representing the world's longest continuing artistic traditions.<sup>1</sup> Importantly, it is also a unique archive of Australian *history*, revealing relationships between local Aboriginal groups and visitors to their shores. In this paper we explore the contact period rock art and, more specifically, depictions of ships at a site called *Djulirri* (also spelt *Djurirri*) in north western Arnhem Land, Australia. During our 2008-2012 study of contact rock art we found that, in northern Australia, ships dominate the introduced imagery made during the last 500 years.<sup>2</sup> This,



in turn, has forced us to question how rock art can help us understand the roles that these ships played in Aboriginal life and the impact of new maritime ventures on local communities.

Contact rock art is a little studied area in Australia yet this archive provides us with some of the only contemporary Indigenous accounts of interactions that were taking place after the arrival of Asians and Europeans. Working with Traditional Owner Ronald Lamilami and his family, fieldwork was undertaken in the Wellington Range area of northwestern Arnhem Land between 2008 – 2011 to document contact rock art, as part of the *Picturing Change* and *Baijini, Macassans, Balanda, and Bininj* projects (see Taçon and May editorial, this volume). During our surveys of the Wellington Range (Figure 1) we recorded over 200 rock art sites, with contact period rock art concentrated in a number of particular locations.<sup>3</sup> Three rock art complexes were then selected for more detailed recording and analysis. These site complexes are known locally as *Malarrak*, *Maliwawa (Bald Rock)*, and *Djulirri*. Each complex consists of multiple rock shelters housing a large number of rock paintings, beeswax figures, stencils and prints. Rock shelters with hundreds of rock paintings are not unusual in this part of Arnhem Land, however, our selection of case study sites was based on the number and diversity of contact images present in the Wellington Range.<sup>4</sup>

Map of Northern Australia



Figure 1: Map of northern Australia showing study area.

For this paper, we focus on one of these case study sites – *Djulirri*, a site recently added to the Northern Territory Heritage Register and now nominated for National Heritage Listing (Figure 2). Djulirri is the

*Maung* language name for a series of rock shelters that adjoin each other and overlook a long valley of other painted rock shelters. It sits approximately 20 kilometres from the coast in the Wellington Range sandstone massif which is surrounded by coastal plains and a number of small to large rivers that feed out into the sea. It was important to the team that all surviving rock art at a site was documented, not just the contact period art or the introduced subject matter such as ships, horses and guns. This allowed us to analyse contact art within its full rock art context. At just the main gallery of this site over 1100 individual rock paintings, 46 beeswax figures, 17 stencils and 1 print were documented.



Figure 2: General view of one section of the Djulirri rock art complex, Arnhem Land.

Before looking specifically at the ships, it is important to have a general idea of the contact rock art present. To summarise, the earliest identifiable contact art at Djulirri (and the oldest yet found in Australia) dates to before AD1664 (and possibly to sometime in the 1500s) with the depiction of a yellow painted Macassan prau.<sup>5</sup> This prau is painted beneath a beeswax 'snake' that was sampled and radiocarbon dated, hence, providing a minimum age. Importantly, many hundreds of paintings were produced at Djulirri after this date and continued to be produced until approximately 50 years ago. Other contact rock art at this site includes a bicycle, a buggy, letters from the English Alphabet, Ngalyod (the Rainbow Serpent), and kangaroos depicted in x-ray form.<sup>6</sup>

At least 25 introduced types of watercraft (including praus) are painted at Djulirri and research is still continuing into the possible

identity and age of many of these vessels. Rather than discussing each of the ships individually, we focus on six key examples for this paper. First, however, it is important to acknowledge that Arnhem Land rock art is not always a literal depiction of the subject matter and, in our analysis to-date, there are rarely definitive matches between the rock art images and named ships – thus we take a cautious approach to identification. While some ships may have been seen by or visited or worked upon by local Aboriginal people, others may be a mixture of features from different ships sometimes with additions being made over time, perhaps by different artists. Some show less familiarity between artist and subject matter. Other paintings suggest that the artist may have only seen their subject matter in magazines, newspapers, books or possibly as decoration on tobacco tins in the nineteenth century. One of the remarkable aspects of Djulirri is the ability to explore these issues thanks to a diversity of depictions over a long time period.

It has become increasingly apparent to the authors of this paper that a solely technical analysis of paintings of ships in rock art does little to increase our understanding of the images themselves and the cultures of which they are part. Technical analysis does assist in defining the multiple layers of change that may occur within a single motif which in turn reflects industrial chronologies of the 19<sup>th</sup> and 20<sup>th</sup> Centuries. We firmly believe that such images must first be considered in their archaeological and rock art context. The case studies presented in this paper highlight not only the shortfalls of non-contextualised descriptive analysis of ships in rock art but also the enormous benefits of merging archaeology, rock art studies and maritime history to study the contact period in Australia.

## **Prau**

The oldest non-Indigenous vessels depicted at Djulirri are almost certainly prau (also known as proa or perahu). These vessels relate to the often overlooked period in Australian history when fleets made seasonal visits from southern Sulawesi (predominantly from Macassar, hence the reference to *Macassan* prau) and neighbouring regions to northern Australia to harvest trepang and trade with Aboriginal groups for goods such as turtle shell, iron wood and pearl shells, in return providing items such as food, tobacco, alcohol, cloth, axes and knives.<sup>7</sup> Large

and regular fleets of prau sailed in with the northwest monsoon each December and returned home with the southeast trade winds around March or April.<sup>8</sup> These seasonal visits ceased around 1906.<sup>9</sup> During their visits, the Macassans are thought to have developed close social as well as economic ties with the local Aboriginal groups across coastal Arnhem Land and including Groote Eylandt.<sup>10</sup> Abundant accounts have reliably noted that Aboriginal men worked as crew aboard Indonesian sailing vessels.<sup>11</sup> The yellow painted prau at Djulirri is currently the earliest rock art evidence we have for Macassan contact with Australian shores<sup>12</sup> (Figure 3).

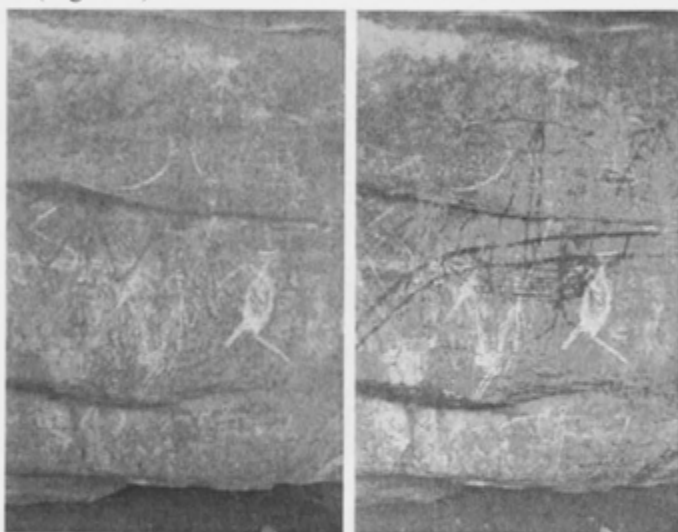


Figure 3: Yellow painted prau from Djulirri (left) and enhanced version (with DStretch) of the same image (right) showing the prau underneath other paintings and beeswax figures.

The main characteristics shown in Aboriginal representations of praus can be understood by looking at the designs of the various vessels used in southern Sulawesi and its nearby region, from whence the Macassan seafarers originated. A number of key features in Arnhem Land paintings of praus have been identified including (but not limited to): (a) high projections at bow and stern, (b) multiple projections from the bow, (c) tripod masts and rectangular sails, (d) twin rudders, and (e) deck housing.<sup>13</sup>

The early prau at Djulirri (Figure 3) is a good example of a Macassan vessel with its distinctive tripod mast and rectangular sails but lacks the detail of prau painted in other areas visited by Macassans, especially Groote Eylandt.<sup>14</sup> Clarke and Frederick<sup>15</sup> suggest that the detail of Groote Eylandt prau paintings reflects the frequency and duration of Macassan visitation over European visitation. At Djulirri this is, in fact, the opposite with European vessels depicted with greater detail and frequency than prau. Whether or not this suggests a less substantial (or very different) relationship between Macassan visitors and Aboriginal communities in northwest Arnhem Land is the subject of ongoing research.

### Steamers

One of the paintings that most drew our attention at Djulirri was the depiction of a steamer in profile with intricate detail including port holes and a bow wave (Figure 4). The style of this painting is very unusual for the art of this area. For instance, the angle on which the ship is painted and the possible alternative view of the same ship (Figure 5) suggest an artist with some training in European methods perhaps through their schooling on nearby Goulburn Island or at the Gunbalanya (Oenpelli)



Figure 4: Painting of steamer from Djulirri.

Mission.<sup>16</sup> Goulburn Island Aboriginal men were also no strangers to modern seafaring in the early to mid-20<sup>th</sup> Century, as crewing and even skippering Mission boats has been well documented.<sup>17</sup> The attention to

detail and the use of perspective and colour all add to the uniqueness of this image.



Figure 5: Front view of ship painting from Djulirri, possibly the same ship as depicted in Figure 4.

The steamers painted at Djulirri could represent vessels such as the Burns Philp ship *M.V. Merkur* (5,946 grt, 393 x 51.9 ft) or her sister ship the *M.V. Neptuna* (5,944 grt, 393.1 x 52 ft) (Figure 6). These sister ships, both with twin funnels as in the rock painting, were built in 1924 for Flensburger Dampfer Co by Krupps. The ships were originally named *Rio Panuca* and *Rio Bravo* and operated in North and South American services, before being laid up during the depression in 1931. They were purchased by Norddeutscher Lloyd and renamed *Neptuna* and *Merkur* in 1934 for use on the Australia-New Guinea-Hong Kong service but Australian objections to this intrusion into its traditional routes led to the cessation of the plan and the sale of the two ships to Burns Philp in 1935. *Neptuna* operated from 1935 to 1942 for Burns Philp, and *Merkur* from 1935 to 1953. *Neptuna* operated the Hong Kong route, while

*Merkur* joined *Marella* on the Singapore – Java service via Darwin. *Neptuna* was sent to Darwin with supplies days before the Japanese bombing, and her cargo of mines exploded during the attack, sinking the ship at the wharf and killing 45 men. *Merkur* continued on the Singapore service after the war, she was overhauled and given a black hull in 1949, and was sent to the breakers in 1954.<sup>18</sup> Importantly for the interpretation of this rock painting, *Merkur* and *Neptuna* appear to have been the only Burns Philp ships with twin funnels. These Burns Philp ships are regularly referred to in accounts by the Missionaries that went to the AIMS missions across Arnhem Land.<sup>19</sup> Lamilami<sup>20</sup> notes that he and others were frequently sailing between Goulburn Island and Darwin harbour where they would encounter the Burns Philp steamers.



Figure 6: Possibly a modified MV *Neptuna* in c.1942, a ship similar to that painted at Djulirri and depicted in Figures 4&5 (courtesy National Library of Australia nla.pic-vn4349313).

There is no doubt that Djulirri was still being used by local Aboriginal people during World War Two. Surface artefacts (i.e. bottle shard dated 1942) stand alongside the rock art as evidence. It is the detail of this painting that suggests a ship well-known to the artist, perhaps having sighted the steamer or seen it in newspapers. After the establishment of the Goulburn Island Mission in 1916, it is possible that the artist came across these ships during World War Two as Aboriginal people of Arnhem Land commonly travelled as far as Darwin at this time.

## Two masted sailing vessel, steamer or both?

As with other rock art across Arnhem Land, a seemingly straightforward painting of a ship is actually very complex. On publication of an earlier article<sup>21</sup> this image (Figure 7) and its caption attracted the attention of a number of maritime historians and archaeologists. What many failed to recognise (and what was very difficult for non-rock art researchers to see from a small photograph in a journal article) was that this image was not produced in one sitting and probably not by any one artist but is the product of layering and retouching or reworking original images to produce something different.<sup>22</sup> This is not uncommon in rock art of western and north western Arnhem Land (or in other areas of Australia such as the Kimberley).



Figure 7: Layered painting of ships from Djulirri, northwestern Arnhem Land.

Detailed analysis further adds to our understanding of layered painting. Originally the ship was most likely a two masted vessel painted using red ochre (almost pink in colour) with human figures with hands on hips standing on deck to the left (only one is still clear). The ship also has a large almost Macassan-style rudder. Later the vessel was completely re-outlined in red with additional rectangles across the side of the ship and a smokestack with smoke added. Perhaps during the same sitting, the neighbouring painting of a crocodile leg was also re-outlined and lengthened so it crosses over the top of the ship. Another repainting event took place using kaolin clay (white) whereby the artist added two



crew members on deck, as well as some letters, and reoutlined some of the rectangles on the hull. The shape of the hull is significantly different to the other steamship at Djulirri (including Figure 4) and to those at Mt. Borradaile.<sup>23</sup>

It is unlikely we will ever know exactly which ship the artists were originally depicting (if they were in fact thinking of just one ship at all). Twin masted vessels visited northern Australia regularly from the early to mid-19<sup>th</sup> century. The artists could have seen such vessels along the coast and at major settlements (such as Victoria Settlement/Pt Essington and Fort Dundas) throughout this period. For example, in 1827, Captain Stirling commanded the HMS *Success* and was accompanied by 3 merchant vessels to establish Fort Wellington.<sup>24</sup> The ships involved in starting the Fort Wellington settlement included the HMS *Success* and the merchant vessels were known as the *Marquis Of Landsdowne*, and the *Amity* and Caledonian brigs.<sup>25</sup> Figure 8 illustrates one example of a two masted vessel from 1840 near Pt Essington. Interestingly the artist chose to depict three Aboriginal men (one in European dress) surveying the scene from a distance. While local Aboriginal people would have been very familiar with Indonesian sailing vessels (prau) visiting their shores, in 1840 the site of a British sailing vessel under repair would still have been considered unusual. In cases such as the HMS *Pelorus*, Aboriginal people had the opportunity to see parts of the ship usually hidden below the waterline. It is interesting to note, however, that the Royal Navy vessels, such as HMS *Pelorus*, were predominantly square rigged, whereas the vast majority of depictions found to date in Aboriginal art appear to be fore-and-aft rigged. As suggested below, this may reflect the experience of Aboriginal artists, who were familiar with, and often worked on or travelled on fore-and-aft rigged ships, but seldom on larger square-riggers.

In terms of the later adaptation to a steamship there are a few possibilities. These ships are possible candidates due to the limited number of single funnel, two masted ships navigating the north Australia waters. Twin masted steamships were utilised on the Overland Telegraph Line supply run to the Roper River depot in 1872. The SS *Young Australian* puts into South Goulburn Island in 1872 to wait out rough weather conditions and affect repairs after becoming waterlogged. From this time, Goulburn Island becomes known as a safe harbour with



Figure 8: H.M.S. *Pelorus* at low water, 1840 (Owen Stanley, State Library of NSW).

fresh water. An etching in the *Northern Territory Times and Gazette* in 1899 illustrates the SS *Cygnets* cruising past the Goulburn Islands.

One possibility is the S.S. *Wollowra* operating for the Adelaide Steamship Company on the Australian coast from 1894 to 1915.<sup>26</sup> Alternatively, the *Changsha* and *Taiyuan*, built in 1886 in Scotland, together with two sister ships, operated for the China Navigation Company transporting Chinese migrants and labourers between China and Australia from 1886. In 1912 the Australian-Oriental Line purchased the *Changsha* and *Taiyuan*, as well as Burns Philp's *Guthrie*, to carry on the same trade, taking a route from Melbourne, Sydney, Brisbane, Queensland ports, Thursday Island, Darwin, the Philippines, to Hong Kong. They maintained this route until 1926, when they were replaced with new ships.<sup>27</sup>

There are also other possibilities – the S.S. *Airlie* and *Guthrie* (Figure 9) operated for Eastern and Australian Steamship Company from 1884, then Burns Philp from 1904, between Singapore and Australia, with stops at Darwin. *Airlie* was withdrawn and broken up in 1912, the *Guthrie* was sold to the Australian-Oriental Line (see above), but only ran one trip before being sold on again and wrecked in 1914.<sup>28</sup> Likewise, the S.S. *Coolgardie* operated on the Western Australian goldfields trade for McIlwraith McEacharn as the *Boswell Castle* (1896-1899) then the *Coolgardie* (1899-1913). The ship then operated for other owners in the Pacific until broken up in 1922.<sup>29</sup>

However you look at this series of paintings there is no simple answer to the question of identification. The significant chronological value though is that these larger twin masted sailing steamers were antiquated and on their way out of common use by the 1920s in Northern Territory waters. Considered in its wider archaeological context, however, it forms part of a wonderful story of shipping and Aboriginal re-use and re-touching of paintings of ships.

### Naval Vessels

Painted immediately adjacent to the twin funnel steamer (depicted in Figure 4) is another vessel possibly associated with naval activities (see Figure 10). While not precise, the image seems to show what appears to be two single gun mounts or at least two projections forward and

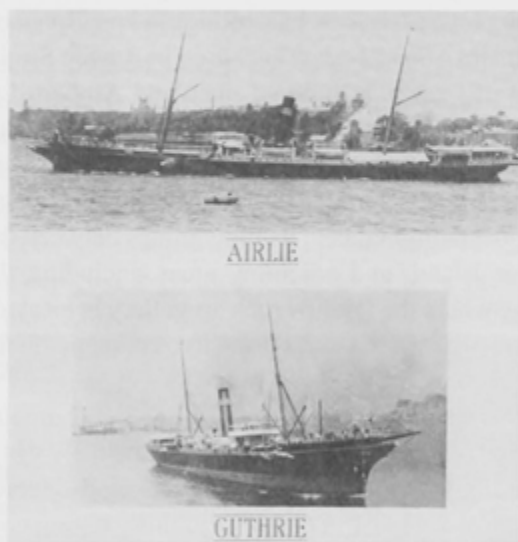


Figure 9: S.S. *Airlie* and *Guthrie* (Plowman 1981 Vol 1: 136).

aft, a single funnel, two masts connected by lines (possibly a radio array), a raised bridge and flush deck, with vertical bow and stern entry lines. While some colonial gun-boats had guns incorporated into the main superstructure as shown here, they also had very little freeboard forward, and hence a very distinctive profile, not shared by this image. In all later naval vessels the guns were on stand-alone gun mounts or in separated turrets. One possible but not particularly good match is

with HMAS *Gayundah*, one of two sister ship gunboats purchased by the Queensland colonial administration in 1884 and subsequently transferred to the Australian navy. Designed for coastal defence, the ship had a very low freeboard fore and aft, with a forward gun mounted within the main superstructure, and a rear gun in an open turret, together with lighter armaments. She had two masts and a single funnel, though at the time she was in Northern Territory waters in 1911 her forward gun had been removed, and from 1914 her bow had been built up to increase seaworthiness.

*Gayundah* had an interesting role in northern Australian history. In 1911 the *Gayundah* was sent on a cruise to Broome, to show the presence of the new Royal Australian Navy in northern seas, and reinforce Australia's power to control and impose customs duties on the fishing, trepang (*beche de mer*) harvesting, and pearling activities of Indonesian ships. HMAS *Gayundah* anchored in Bowen Strait between the southern end of Croker Island and mainland Arnhem Land for 3 days from the 30 July to the 1 August 1911, an area frequented by local Indigenous traditional owners crossing the strait between Croker Island and the mainland. During this time there was a great deal of mobility by various traditional land owning groups between the Coburg Peninsula, Croker Island, and adjoining areas, including the nearby Wellington Range where the Djulirri rock art gallery is located, and it is highly likely that Traditional Owners came into contact with the HMAS *Gayundah* during this time.

Considering other naval vessels roughly fitting the characteristics of the rock art example, River and Bay Class frigates of World War Two had fore and aft single guns and single funnels, and operated out of Darwin, but had only one mast. A closer fit to this painting could be the Bathurst Class minesweeper, of which over 50 were built after 1940 and many frequented Darwin and northern waters during WWII, but these vessels lacked a flush deck.

A more likely possibility than any of these is that the image is of HMAS *Moresby*, a survey vessel based often in Darwin (Figure 11). *Moresby*, built as a 24 Class Convoy Sloop HMS *Silvio* in 1918, was acquired as a survey vessel for the RAN in 1925 and carried out much survey work in northern Australia before being sold in 1947. The vessel was 276.5 ft long, and 1650 tons. The ship had a flush deck, like the



Figure 10: Rock painting from Djulirri, possibly a naval vessel from World War Two. painting, one deck of accommodation, raised bridge, single funnel, two masts and projections (crane spars and awning frames) forward and aft of the superstructure. She had a vertical bow and stern, and carried a variety of guns in different positions at different times. If the painting does in fact depict HMAS *Moresby*, it would suggest a close association in dating between the images making up the panel of several vessels and a bi-plane depicted at Djulirri — all could have been operating in the region in the 1930s.

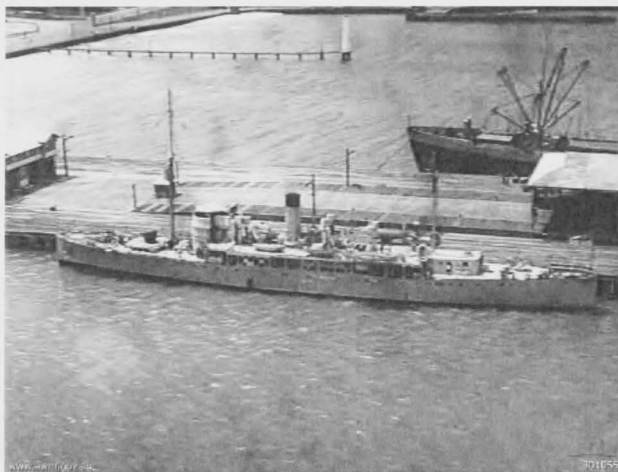


Figure 11: HMAS *Moresby* (Australian War Memorial P02305020 and 301056)

## Luggers

While some vessel types painted at Djulirri are represented by only an individual example, others are in abundance. Luggers are a case in point with many depictions at Djulirri, and other Wellington Range rock art sites, and hundreds of them operating in northern waters from the 1880s through into the 1970s (Figure 12). It is unlikely in these cases, unless some specific link can be made between a boat and an historical event depicted on the rock, that a positive match between the rock art and a single named lugger will be found.

The appearance of lugger-style craft at Djulirri (Figure 13) is not surprising, as the pearling and supply luggers must have been the most common ship type along the Northern Territory coast during the late nineteenth and early twentieth centuries. Many Aboriginal people in the north had experience of the pearling industry. The pearling industry started in 1861 in Western Australia, based initially at Cossack, then at Broome from the 1880s. The shell beds of Darwin were discovered in 1884, and 100 boats travelled from Thursday Island in Torres Strait to test out the grounds, with disappointing results.<sup>30</sup> Various reports in the Northern Territory Times and Gazette contain references to luggers



Figure 12: 'Three men standing in pearling lugger on water, Palmerston [i.e. Darwin], ca. 1890' (Florenz Bleaser collection, National Library of Australia nla.pic-vn3797940).

being utilised as general purpose maritime workhorses in northern Australian waters, supplying buffalo shooters, missions, and customs stations.



Figure 13: Rock painting of a lugger from Djulirri.

Pearling ‘luggers’ were not strictly luggers at all (i.e. they did not have ‘lug’ sails), but were gaff-rigged ketches. Ketches are two-masted vessels, with the aft mast shorter than the mainmast forward. The gaff rig was easy to operate and versatile. The generic term ‘lugger’ was also applied to many other types of vessel engaged in the pearling industry. The early luggers were small vessels of 9–10 m long and 10–15 tons, operating in conjunction with larger mother ships that were often schooners (also often gaff-rigged but with more complicated rigs and 2 or 3 masts of equal height or the aft or central mast the higher). Luggers, however, increased in size over time, and by the mid 20th century many were over double the earlier tonnage and most were motorised.

As O’Connor and Arrow<sup>31</sup> argue for the Kimberley region, the depiction of luggers (and other types of ship) is not a case of an artist depicting an unknown or unusual contact event:

“While the boats represented are European and therefore are categorised as ‘contact art’, it is unlikely they were perceived as ‘foreign’ by the Indigenous people painting them... the three European boats described here would have been a common sight along this coast from the early 1900s until as late as the 1950s”.<sup>32</sup>

The luggers depicted at Djulirri would have been very familiar to the Aboriginal artist/s and, as such, they were depicting their own life rather than just commenting on the strange activities of the 'other'. Roberts<sup>33</sup> work at nearby Mt Borradaile also reveals a dominance of sloops, cutters, ketches and schooners in rock art – all common vessels in this area during the nineteenth and twentieth centuries and all used to supply a variety of industries such as buffalo shooting camps, timber milling, as well as Anglican and Catholic Missions – the new places Aboriginal people associated with and increasingly resided in.

### **Discussion and Conclusion**

Our research emphasises that depictions of ships in rock art have potential to deepen our understanding of the maritime history of this country, but from an Indigenous perspective. At Djulirri, and throughout the west and northwest of Arnhem Land, we have a detailed Aboriginal pictorial account of Australia's maritime history. Unravelling this history is a mammoth task that will continue for many years. It requires expertise from a range of disciplines, including rock art, Indigenous archaeology, history, and more. It also requires a holistic approach to analysis incorporating descriptive analysis of the design features of individual paintings alongside of wider rock art and archaeological studies. A descriptive analysis alone does little to further our understanding of this important heritage.

It is clear from our research that in northern Australia ships played a significant role in the lives of Aboriginal people in this area since at least the 17<sup>th</sup> century. Artists have depicted this subject matter as part of ongoing artistic systems of representation but in far higher numbers than other contact period subject matter, such as guns, horses, and cattle. This can now be proven thanks to our wide-scale archaeological/rock art surveys of the area. So why depict so many ships? And what can these depictions teach us about the role of such watercraft in Aboriginal life at the time? The examples presented in this paper help to answer these questions in their own way. They tell stories of vessels well-known across the northern coast of Australia and others that might only have been seen once. As well, they suggest artists were not only familiar with their subject matter but also not afraid to use 'artistic licence' and new techniques for painting. The paintings reflects the involvement of



Indigenous communities in the new maritime industries and technologies that appear on their coastlines. They suggest watercraft became part of Aboriginal story-telling traditions but were not stagnant instead being updated and renewed with the coming of new watercraft into north Australian waters. While European artists aboard ships travelling the coast of Australia may have believed they were the observers, in fact, Aboriginal artists were engaging in similar behaviour.

### Acknowledgements

We would like to thank Ronald Lamilami and his family for their support, guidance and enthusiasm throughout this project and for encouraging us to expand this work in coming years. *Picturing Change* was funded by ARC Discovery Grant DP0877463 and we would like to acknowledge Dr. June Ross and Dr. Alistair Paterson as fellow Chief Investigators on this project. *Baijini, Macassans, Balanda, and Bininj* was funded by ARC Linkage Grant LP0882985 awarded to Sue O'Connor. While we do not have the space to thank all of the volunteers who helped with the site recording we would like to highlight the contributions of Melissa Marshall, Ines Domingo Sanz, Janet and Phil Davill, Wayne Brennan, Kirsten Brett and Michelle Langley who spent several weeks at these sites helping to produce detailed recordings. Thanks to Injalak Arts and Crafts and the Northern Land Council for their support of our research. Finally we would like to acknowledge The Australian National University and Griffith University, for their support of rock art research.

## ENDNOTES

- 1 Chaloupka, G, 1993, *Journey in Time: the 50,000 year story of the Australian Aboriginal art of Arnhem Land*, Chatswood, Reid.
- 2 Taçon, P.S.C. 2012, 'On the rocks: ships at Aboriginal rock-art sites', *Signals* 99:22-29; Taçon, P.S.C., Paterson, A., Ross, J. and S.K. May, 2012, Picturing change and changing pictures: contact period rock art of Australia. In J. McDonald and P. Veth (eds.), *A companion to rock art*, pp.420-436. Blackwell Publishing Ltd, Chichester; Wesley, D., McKinnon, J.F. and Raupp, J.T., 2012, Sails set in stone: a technological analysis of non-indigenous watercraft rock art paintings in north Western Arnhem Land, *Journal of Maritime Archaeology* 7:245-269.
- 3 May, S.K., Taçon, P.S.C., Wesley, D. and Travers, M., 2010, 'Painting history: Indigenous observations and depictions of the 'other' in northwestern Arnhem Land, Australia', *Australian Archaeology*, 71, pp. 57-65.
- 4 Ibid.
- 5 Taçon, P.S.C., May, S.K., Fallon, S, Travers, M, Wesley, D, and Lamilami, R, 2010, 'A minimum age for early depictions of Southeast Asian praus in the rock art of Arnhem Land, Northern Territory', *Australian Archaeology*, 71, pp. 1-10.
- 6 May et al. 2010, p. 61.
- 7 Macknight, C, 1976, *The Voyage to Marege. Macassan Tregangers in Northern Australia*, Melbourne University Press, Melbourne; Clarke, A, 2000, 'The Moormans Trousers': Macassan and Aboriginal interactions and the changing fabric of indigenous social life. In S. O'Connor & Veth, P (eds), *East of Wallace's Line: Studies of Past and Present Maritime Societies in the Indo-Pacific Region*, Modern Quaternary Research in Southeast Asia 16, A. A. Balkema, Rotterdam, pp. 315-335.
- 8 Chaloupka, G, 1993, p.191; Macknight 1976.
- 9 Macknight 1976, p. 84; Roberts, D.A. 2004. 'Nautical themes in the Aboriginal Rock Paintings of Mount Borradaile, Western Arnhem Land'. *The Great Circle*, 26(1), pp. 19-50.
- 10 Macknight 1976; Chaloupka, G, 1996, Praus in Marege: Makassan subjects in Aboriginal rock art of Arnhem Land, Northern territory, Australia, *Anthropologie*, 34 (1-2), p. 131; Clarke, A, and Frederick, U, 2006, Closing the Distance: Interpreting Cross-Cultural Engagements through Indigenous Rock Art. In I. Lilley (ed), *Archaeology in Oceania, Australia and the Pacific Islands*, Blackwell, MA, p. 119; Mitchell, S, 1994, Stone exchange network in north-western Arnhem Land: Evidence for recent chronological change. In Sullivan, M, Brockwell, S, and Webb, A, (eds), *Archaeology in the North: Proceedings of the 1993 Australian Archaeological Conference*, Northern Australian Research Unit, Darwin, pp. 188-200.
- 11 See Berndt R. M. and Berndt, C.H. 1954. Arnhem Land: Its history and its people, F. W. Cheshire, Melbourne; Clarke, A. 1994. Winds of change: An archaeology of contact in the Groote Eylandt archipelago, Northern Australia, Unpublished PhD thesis, Australian National University, Canberra; Lamilami, L. 1974. Lamilami speaks: The cry went up. A story of the people of Goulburn

- Islands, North Australia, Ure Smith, Sydney; Macknight 1976; Macgillivray J (1852) Narrative of the Voyage of H.M.S. Rattlesnake, Commanded By the Late Captain Owen Stanley, R.N., F.R.S. Etc. During the Years 1846–1850, vol 2. T. & W. Boone, London; Mitchell, S. 1994. Culture contact and indigenous economies on the Coburg Peninsula, northwestern Arnhem Land, Unpublished PhD thesis, Northern Territory University, Darwin.
- 12 Taçon et al. 2010, p.1.
  - 13 Burningham, N. 1994. Aboriginal nautical art: a record of the Macassans and the pearling industry in the Northern Territory. *The Great Circle* 16: 139–151; Burningham, N. 2000. Sublime but not ridiculous: observations on the technical analysis of ships of first contact represented in various genre of art. *Bulletin of the Australasian Institute for Maritime Archaeology* 24: 63–70; Chaloupka 1996, pp. 131–142.
  - 14 Clarke and Frederick 2006, pp. 116–133; May, S., McKinnon, J. and Raupp, J. 2009, 'Boats on Bark: An Analysis of Groote Eylandt Aboriginal Bark-Paintings featuring Macassan Praus from the 1948 Arnhem Land expedition, Northern Territory, Australia', *The International Journal of Nautical Archaeology*, 38(2), pp. 369–385.
  - 15 Clarke and Frederick 2006.
  - 16 McKenzie, M. 1976 Mission to Arnhem Land. Rigby Ltd, Sydney.
  - 17 Lamilami 1974.
  - 18 Wilkinson, B.A. & Willson, R.K., 1981, *The Main Line Fleet of Burns Philp*, The Nautical Association of Australia Inc., Canberra, pp. 134–139.
  - 19 McKenzie, M. 1976 Mission to Arnhem Land. Rigby Ltd, Sydney.
  - 20 Lamilami 1974.
  - 21 Taçon et al. 2010.
  - 22 See Taçon et al. 2010, p. 5 where various additions to the original painting are mentioned.
  - 23 Roberts, D.A. 2004. 'Nautical themes in the Aboriginal Rock Paintings of Mount Borradaile, Western Arnhem Land'. *The Great Circle*, 26(1), pp. 19–50.
  - 24 Wilson, T.B. 1835 Narrative of a Voyage Round the World, Gilbert and Rivington, Printers, London, p. 130.
  - 25 Ibid.
  - 26 Plowman, Peter, 2007, Coast to coast – The great Australian coastal liners. Rosenberg Publishing Pty Ltd, Dural (NSW), p. 24.
  - 27 Plowman, Peter. 1981. *Passenger ships of Australia and New Zealand Vols 1 (1876–1912) and 2 (1913–1980)*, Doubleday, Sydney, Vol 1: 214.
  - 28 Ibid, Vol 1: 136.
  - 29 Ibid, Vol 1: 82.
  - 30 Simpson, C. & de Burgh Norman, E, 1963, 'Pearls and Pearling', in Chisholm, A.H. (ed), *The Australian Encyclopaedia*, The Grolier Society of Australia, Sydney, vol.7, p. 44.
  - 31 O'Connor, S. & Arrow, S, 2008, 'Boat images in the rock art of northern Australia with particular reference to the Kimberley, Western Australia', *Terra Australis* 29, pp. 397–409.
  - 32 Ibid, p. 407.
  - 33 Roberts 2004.

Appendix C

C. May, S. Taçon, P. Wesley, D. and M. Travers, 2010. Painting History: Indigenous observations and depictions of the other in NW Arnhem Land. *Australian Archaeology* 71 pp. 57-65.

# PAINTING HISTORY:

## Indigenous Observations and Depictions of the 'Other' in Northwestern Arnhem Land, Australia

Sally K. May<sup>1</sup>, Paul S.C. Taçon<sup>2</sup>, Daryl Guse<sup>3</sup> and Meg Travers<sup>1</sup>

### Abstract

In this paper we focus on contact rock paintings from three sites in northwestern Arnhem Land, Australia. In doing so we highlight that such sites provide some of the only contemporary Indigenous accounts of cross-cultural encounters that took place across northern Australia through the last 500 years. Importantly, they have the potential to inform us about the ongoing relationships that existed between different parties. The lack of research on contact rock art is emphasised and the development of a large scale-project (of which this fieldwork is part) aimed at addressing this problem is outlined. Important new findings for contact rock art are presented, including evidence for 'traditional' protocols relating to rock art continuing long after first contact, evidence for particular contact period subject matter dominating in art of this region, and the oldest date yet recorded for contact art in Australia.

### Introduction

Indigenous societies worldwide underwent tremendous and rapid change following contact with other societies such as British explorers and traders, Macassan trepanning crews and Christian missionaries. There is now a vast and growing literature on the nature of early contact in Australia; However, rarely have Australian contact rock art images been studied comprehensively. In 2008 a large-scale Australian Research Council-funded project titled *Picturing Change: 21st Century Perspectives on Recent Australian Rock Art* was initiated by Paul S.C. Taçon, Alistair Paterson, June Ross and Sally K. May to address this issue. While *Picturing Change* includes four key regions (Wollemi National Park in New South Wales, the Pilbara of Western Australia; Central Australia; and western/north-western Arnhem Land), this paper focuses on preliminary results from fieldwork in Arnhem Land only and reports on the significance of these findings to this national initiative.

### Background

While individual contact rock paintings and petroglyphs were noted by a number of early Australian archaeologists, ethnographers, anthropologists, explorers and artists (e.g. Mountford 1956:162, 175), it was not until the 1990s that detailed summaries and overviews of contact rock art in Australia began to appear. This included Robert Layton's (1992)

*Australian Rock Art: A New Synthesis* which provided a brief and selected overview of contact rock art. Ursula Frederick (1997, 1999) is one of the few in Australia who has undertaken focused contact rock art research, concentrating on Watarrka (Kings Canyon) National Park, and with Annie Clarke, on depictions of ships on Groote Eylandt (see Clarke 1994; Clarke and Frederick 2006; Roberts 2004). As Frederick (1999:132-133) notes, contact studies remain a largely unexplored theme in Australian rock art research, yet 'the rock art of contact provides generous scope for a convergence of archaeological, anthropological and historical research designs'.

Interestingly, McNiven and Russell (2002: 32-33) note a clear focus on secular interpretations of contact rock art when it has been interpreted by previous researchers. They conclude that 'By extending a counter-reading of sketchy historical sources to include archaeological evidence such as contact rock art, we have revealed the existence of a post-contact Indigenous landscape that was regulated by ceremonial strategies and systems of place marking designed to combat European colonisation' (McNiven and Russell 2002:37; see also David and Wilson 2002:57-58).

Outside Australia there has been recent interest in contact images, with important studies particularly in southern Africa (e.g. Ouzman 2003; Ouzman and Loubser 2000; Ouzman and Smith 2004) and in North America (e.g. Keyser and Klassen 2003; Klassen 1998; Klassen *et al.* 2000; Molyneux 1989). Significantly, the art of prehistoric Europeans, Indigenous Australians and other peoples of the world has always informed debates about the nature of art, culture and society, with much progress in the recognition of the existence of cave art by the scientific community occurring early in the twentieth century (Bahn and Vertut 1997:22). At the same time, Indigenous peoples entered their own forms of discourse about European encounters and the nature of the world as well, some of which have been preserved in rock art. As Molyneux (1989:212) notes for changing depictions in Micmac rock art of eastern Canada:

As shown by the many other petroglyphs of colonial settlements, wigwam villages, churches, altar-pieces, sailing ships, and other aspects of 18th- and 19th-century life, the Micmac were observers and, from their side of the issue, participants in the changing world.

Ouzman (2003:253) continues this argument, suggesting that the Indigenous 'reverse gaze' through rock art of the contact period has the potential to inform us about a diversity of issues including expanding our understanding of ourselves. He argues in relation to Bushmen beliefs about the rock art of southern Africa:

These beliefs ... are one of the most powerful means of informing ourselves not only about Bushman society, but about non-Bushman. The irony is that the information flow is still very

<sup>1</sup> School of Archaeology and Anthropology, Research School of Humanities and the Arts, The Australian National University, Canberra, ACT 0200, Australia sally.may@anu.edu.au, u4129920@anu.edu.au

<sup>2</sup> School of Humanities, Griffith University, Gold Coast Campus, PMB 50, Gold Coast Mail Centre, QLD 9726, Australia p.tacon@griffith.edu.au

<sup>3</sup> School of Culture, History and Society, College of Asia and the Pacific, The Australian National University, Canberra, ACT 0200, Australia daryl.guse@anu.edu.au

much from 'them' to 'us' but the type of information so gained is qualitatively different to the usual rock-art research because it tells us as much about who we are and, perhaps more to the point, who we are not, as it does about the rock-artists. The indigenous reverse gaze imagery is also unfettered and uncensored by the mental and iconographic constructions of the colonists (Ouzman 2003:253).

Both the Canadian and South African examples are applicable to Indigenous Australia in that they challenge Australian rock art researchers to consider the implications of the 'reverse gaze' for this continent, as well as the ways it affects our reading of contact histories.

Our own research aims to expand upon these international approaches through the consideration of Arnhem Land (and other regions') art within its wider artistic, archaeological, historical and ethnographic context. In Australia, perhaps more than anywhere else in the world, this is all possible as Indigenous people often remain connected to their rock art heritage and elements of the cultural or historical information embedded in this heritage.

Never before has there been a comprehensive study of Indigenous contact rock art from Australia. As mentioned previously, *Picturing Change* was established to address this shortcoming in Australian rock art research. As Layton (1992:94) suggests, 'The impact of European colonisation on rock art, and all aspects of indigenous culture, extends far beyond the mere depiction of introduced subjects'. This research project thus goes beyond previous approaches that often were limited to introduced subjects, in order to describe the creation of standard motifs and schemas, what is and is not depicted, and the possibility of symbolic meaning. With this project we also aim to illustrate the ways in which contact period rock art is still significant for Indigenous Australians in the twenty-first century and will detail contemporary stories about these important places, many of which are under threat from contemporary industrial development and natural erosion.

## The Study Area

During 2008 and 2009, fieldwork was undertaken in northwestern Arnhem Land or, more specifically, in the Wellington Range, to document rock art. Bordered by the Arafura Sea to the north, King River to the east and the Coburg Peninsula to the northwest, this region is rich in Indigenous culture and associated cultural remains. At the request of the Aboriginal traditional owners no more specific site locations are revealed in this paper. The west and northwest Arnhem region is dominated by the Arnhem Land Plateau with much of the surrounding environmental context influenced by this major geological and geomorphological feature. The region has a diversity of environmental zones including coastal and estuarine areas, alluvial floodplains, major river systems, dissected sandy plains, steep foothills and ridges, and the plateau area itself. The landscape has been affected by significant environmental change since the Pleistocene sea-level rise and subsequent evolution of the major tidal river systems. Geologically the area is dominated by the Kombolgie sandstone subgroups of which the Mammadewerre Sandstone of the Wellington Range is one. The geology of the region in turn gives rise to the development and location of specific

micro-environments such as monsoon vine forests, sedge, grass and paperbark swamps and freshwater springs.

The Wellington Range is one of the northern-most ranges in Australia and covers an area of hundreds of square kilometres. The extent of the rock art is unknown as no systematic surveys of the whole range have taken place. Some researchers, such as George Chaloupka and Daryl Guse, have documented sites as part of their research or employment as archaeological consultants. Chaloupka (1993), in particular, included sites recorded in the Wellington Range in his stylistic chronology of western Arnhem Land rock art.

The Wellington Range covers a large area and parts of the range are 'owned' by different Indigenous cultural groups. The area of interest for this fieldwork belongs to Maung-speakers with Ronald Lamilami as senior traditional owner. Ronald Lamilami's father, Reverend Lazarus Lamilami, was a famous Arnhem Land figure and described many of his experiences, including his relationship to rock art sites in the Wellington Range, in his book *Lamilami Speaks* (1974):

The people of South Goulburn Island, Waruwi, and the people of North Goulburn Island, Waira, are the people we call Malalgorgoidj – Malalgoidj means island, and Malalgorgoidj means people of the island. They are Maung and I am Maung, but I come from the mainland. I come from the mainland on the west side of Goulburn Island. I was born in Ngodigin territory – that is part of Manganowal, and so I am really Manganowal like my father's people (Lamilami 1974:7).

## Methodology

For our *Picturing Change* research we undertook an extensive survey of an isolated part of the Wellington Range. This was done in collaboration with Daryl Guse's PhD research which investigates changes that have occurred in Indigenous occupation of northwestern Arnhem Land in relation to contact with the mythological Baijini, the Macassans, and Europeans. This part of Arnhem Land is well-known for its Macassan heritage and extensive research (including excavation) that was originally undertaken by Campbell Macknight (1969, 1986); rock art was not a focus of his research.

During our survey over 150 rock art sites were recorded using rapid site recording techniques. Rapid site recording involves locating rock art sites via standard foot surveys, completing a rapid site recording form (which incorporates standard archaeological site recording details such as GPS coordinates and site description as well as more detailed sections for art listing styles, techniques and other information), and photographing the site and key rock art images within the site. Three rock art complexes were then selected as case studies for *Picturing Change*. These site complexes are Malarrak, Djulirri and Bald Rock. Each complex consists of multiple rockshelters each in turn housing an extraordinary number of rock paintings. Rockshelters with hundreds of rock paintings are not unusual in western and northwestern Arnhem Land but the complexes we chose contain a great diversity of rock painting styles and time periods. These site complexes were selected as case studies for *Picturing Change* because they also included important depictions of



Figure 1 Djulirri main shelter, showing location of key rock art panels.



Figure 2 Panel featuring a painted prau underneath a beeswax 'snake' at Djulirri (Photograph: Sally K. May).

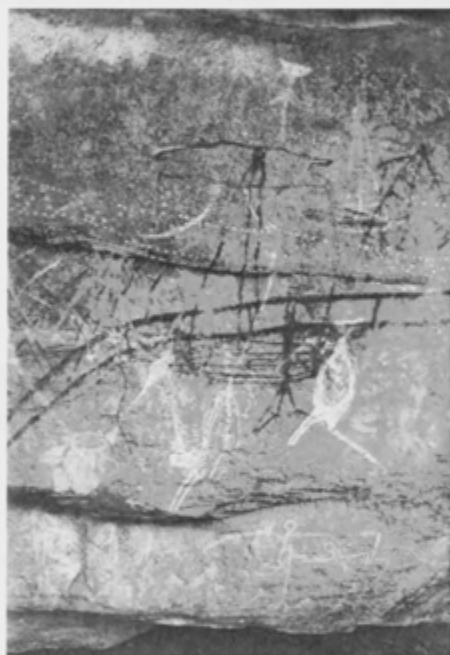


Figure 3 Digital manipulation of Figure 2 highlighting the painted prau underneath the beeswax 'snake' that was dated (see text) (Photograph: Sally K. May).

contact between Indigenous Australians and groups from outside Australia.

Malarrak, Djulirri and Bald Rock were recorded in detail during the 2008 and 2009 field seasons. Malarrak includes four separate rockshelters while at Djulirri the complex was so large that time permitted the recording of only three large adjoining rockshelters (rock faces, ceilings, and associated rocky outcrops) out of 55 in close proximity (see Taçon *et al.* in press) and dozens more sites nearby. Finally, at Bald Rock a single large rockshelter was documented. At each of these shelters a full detailed

inventory was made of the artworks (including descriptions, scaled and unscaled photographs and measurements for each figure). Associated archaeological evidence was recorded and excavations were undertaken in two of these shelters (Malarrak and Bald Rock). The rock art data were then put into a database for analysis. At Djulirri and Bald Rock samples were taken from beeswax art covering contact rock paintings and submitted for radiocarbon dating. The samples were chosen to provide minimum and/or maximum ages for some of the key contact rock paintings at the site. This fieldwork was undertaken in

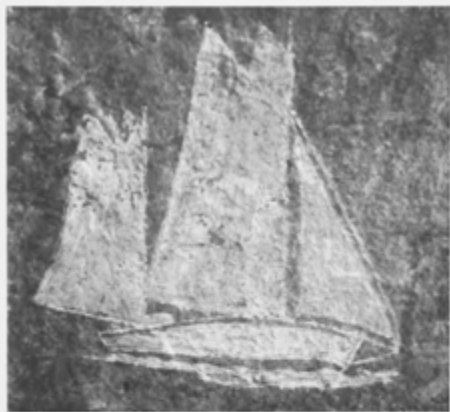


Figure 4 One of the painted sailing vessels at Djulirri (Photograph: Sally K. May).



Figure 5 Human figure depicted with boxing tape or gloves, Djulirri (Photograph: Sally K. May).

collaboration with Ronald Lamilami and his family. They accompanied us to each of the sites and allowed us to record ethnographic information relating to the region, the individual sites, and where possible, individual motifs.

## Results

### Djulirri

Djulirri is the Indigenous name for a series of rockshelters in the Wellington Range. The shelters adjoin each other and overlook a



Figure 6 X-ray emu painted at Djulirri and possibly the most recent painting at the site (Photograph: Sally K. May).

valley and a long network of other marked rockshelters on the other side of this valley (these shelters were documented using rapid site recording techniques in 2009). For our case study, 55m of rockshelter surface plus the ceiling of the rockshelters and the associated rocks were recorded in detail (Figure 1). While the exact number is not yet known, there are at least 20 layers of painting in sections of the rockshelter surface. We documented over 1100 individual rock paintings, plus 46 beeswax figures, 17 stencils and 1 print during the 2008 field season in the area defined in Figure 1. Importantly, for this study we documented rock painting 'scenes' as individual motifs. For example, three human figures standing onboard a ship were recorded as one motif for this research. This is contrary to some standard European practices of rock art recording but was necessary in order to complete the fieldwork in a reasonable time frame. Due to our recording methods, future researchers will still be able to draw out this level of information from our database for their own research if needed.

Just as archaeologists document all artefacts recovered during an excavation we felt it appropriate to record all rock art at a site despite our focus being contact art. This allowed us to analyse contact art within its full rock art context (e.g. Table 1). It is important to reiterate at this point that thousands of other rock paintings and beeswax figures surround the rockshelters we recorded in detail. Djulirri, as a complex of sites, has an extraordinary number of painted shelters and further research is necessary to document these sites in detail.

At Djulirri, introduced subject matter begins before the period AD 1624–1674 with the depiction of a yellow painted Macassan prau (SSAMS ANU-6813). This is the oldest date yet for contact art in Australia. This prau (Figures 2–3) is painted beneath a beeswax 'snake' that we were able to sample and for which we obtained a radiocarbon date, hence, providing us with a minimum age. Many hundreds of paintings were produced at Djulirri after this date. This in itself is an important finding of this research – art was being produced in abundance throughout the contact period, finishing approximately 50 years ago. While introduced subject matter is easy to interpret at Djulirri, contact paintings depicting more traditional subject matter can only be



identified through their rock art context (i.e. paintings of x-ray kangaroos over the top of a painted European sailing ship).

Other contact rock paintings at Djulirri include 28 introduced watercraft (e.g. Figures 2-4), a bicycle, a four-wheeled horse drawn buggy (without any horses), fighters apparently wearing boxing gloves or tape (Figure 5), letters from the English Alphabet, Ngalyod (the Rainbow Serpent), and kangaroos and emus depicted in x-ray form (Table 2). It has been determined that the most recent painting at Djulirri is probably a depiction of an emu with white solid background and red single-line infill, a painting with brushwork similarities to the work of a recently

deceased Indigenous artist now known as Wamud Namok (Figure 6) (see also Brody 1984; West 1995).

### Malarakk

Malarakk is a site complex approximately 10km from Djulirri and is the most accessible of any of the sites we documented. Four rockshelters within this complex were recorded in detail during our 2008 field season. These were not adjoining shelters (as for many of the sites at Djulirri) but were all within a 1km radius. The largest of the Malarakk rock shelters contains 232 paintings, 8 stencils, and 17 identified layers of rock art (Figures

**Table 1** Overview of subject matter depicted at Bald Rock and Malarakk. It highlights the percentage of paintings, stencils and engravings (writing) that depict introduced subject matter. Beeswax motifs have been excluded.

Subject Matter	Bald Rock (WR142)		Malarakk (WR011, WR012, WR013, WR014)	
	#	%	#	%
Artefact	3	0.52	2	0.54
Bird	10	1.73	10	2.72
Composite Being	0	0	2	0.54
Fish	27	4.67	53	14.40
Other Marine	4	0.69	3	0.82
Geometric	64	11.07	89	24.18
Human	233	40.31	121	32.88
Land Mammal	28	4.84	17	4.62
Plant	0	0	2	0.54
Reptile	18	3.11	23	6.25
Unknown	182	31.49	7	1.90
<b>Introduced Subject Matter</b>	<b>9</b>	<b>1.56</b>	<b>38</b>	<b>10.33</b>
<b>Total</b>	<b>578</b>	<b>100.00</b>	<b>367</b>	<b>100.00</b>

**Table 2** Summary of introduced subject matter depicted at Bald Rock, Malarakk and Djulirri. Note that the numbers for Djulirri may increase in the future as further technical analysis of photographs takes place.

Introduced Subject Matter	Bald Rock (WR142)	Malarakk (WR011, WR012, WR013, WR014)	Djulirri (WR057)
Aeroplane	2	0	1
Bicycle	0	0	1
Boiler (unconfirmed)	0	1	0
Building	0	1	0
Can	0	0	1
Coffee Mug	0	1	0
European Boat	1	19	27
Gun	0	3	3
Four-Wheeled Horse-Drawn Buggy	0	0	1
Funnel (unconfirmed)	0	1	0
Horned Animal	0	6	2
Knife – Macassan Origin	0	1	0
Knife – Unknown Origin	2	0	0
Macassan Prau	0	1	2
Human (contact pose and/or moustache)	0	1	1
Human (with introduced accessories such as a hat)	0	0	14
Row Boat with Harpoon	0	0	3
Smoking Pipe	0	2	0
Tobacco Pouch	0	1	0
Tobacco Tin	3	0	0
Unidentified	0	0	1
Writing (English letters or numbers)	2	0	4
<b>Total</b>	<b>10</b>	<b>38</b>	<b>61</b>



Figure 7 Aerial photograph of the Malarrak complex (Photograph: Daryl Guse).



Figure 8 The main shelter at Malarrak (Photograph: Paul S.C. Taçon).

7-8). The oldest surviving paintings appear to be a series of human female figures painted in red and white (Figure 9) as well as a goanna and fork-tail catfish (*Arius leptaspis*) with finely-painted infill. The most recent paintings are a series of large red, white, yellow and red barramundi (*Lates calcarifer*). The largest shelter within the Malarrak complex is also home to paintings of introduced subject matter. These include a metal knife with sheath, a coffee mug, and a prau (Table 2).

The three remaining recorded shelters at Malarrak contain (a) 33 paintings, (b) 57 paintings and 1 beeswax figure and, (c) 33 paintings and 6 stencils. Natural deterioration and damage from feral animals has caused significant damage to two of these four shelters. Contact rock art is found at each shelter and includes sailing vessels, a house-like structure, introduced animals (goats) and guns.

### Bald Rock

The last of our three case studies is generally known as 'Bald Rock' (Figure 10). The Indigenous name for the larger area is Malinawa. As with Djulirri and Malarrak, Bald Rock is a complex of rockshelters each with abundant rock paintings. We decided to record one of the largest rockshelters in the area, and also the one with evidence from the contact period. This site was recorded during our 2009 field season and is c.8.5km from Malarrak. This main shelter at Bald Rock contains 545 paintings, 74 beeswax figures (some of which were single pellets of beeswax) and 31 stencils.



Figure 9 One of a series of human female figures painted in red and white and thought to be the oldest paintings at Malarrak (Photograph: Sally K. May).



Figure 10 The main shelter at Bald Rock (Photograph: Sally K. May).

Bald Rock contains 5 stencils, 3 paintings, 1 engraving and 1 drawing featuring introduced subject matter. This includes two English words – one of these words is drawn with charcoal and is in cursive handwriting. The other is scratched into the surface of the shelter and spells what we suspect is a person's name, Noreman. Three circular stencils, the same size as a typical tobacco tin used widely in Australia throughout the early 1900s, are found at this shelter along with two stencils of large knives. There is one painted boat (an ocean cruiser), one aeroplane (Figure 11) and a possible bi-plane (as also depicted at Djulirri) (Table 2).

## Discussion

There are many intriguing facts that emerge from the data presented here. The first is that, while contact rock art appears from the very earliest contact encounters, it does not replace more traditional rock art styles and subject matter. We know this thanks to detailed recording of the sites and the establishment of a chronology based on superimposition of motifs. In fact, the most recent paintings at all of the sites recorded depict classic Arnhem Land subjects such as fish, macropods and emus in 'pre-contact' styles. It is as though the local artists were noting and commenting upon the introduced aspects of the visiting cultures and then simply returning to their more usual artistic activities. We can confidently say that rock art continued to play a cultural and educational role in these societies long after first contact with non-Indigenous groups.

One of the most interesting aspects of the contact imagery painted at these sites is how the artists used traditional artistic protocols for these new subjects. For example, the artists have repeatedly depicted sailing vessels with full sails, anchors deployed and rudders. Sometimes, crew, cargo and other objects are illustrated. Artists are choosing to highlight the key features of the vessels, just as they highlight the key features when they paint a macropod with internal organs visible (x-ray), even though we would never actually see ships at anchor and in full sail at the same time, or be able to see the rudder and keel below the surface of the water. This is important evidence for the continuation of design conventions across time and subject matter.

From the 157 rock art sites documented during our 2008 and 2009 field seasons, only a small number contained



Figure 11 An aeroplane painted at Bald Rock (Photograph: Sally K. May).

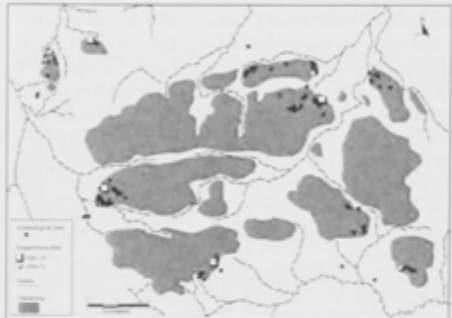


Figure 12 General distribution of all archaeological sites documented in 2008 and 2009 field seasons. It highlights the major and minor contact rock art sites within the study area. Locations have been deliberately generalised to protect the location of the sites.

paintings that were known to be from the contact period (i.e. that depicted introduced subject matter) (see Figure 12 for a preliminary overview of the sites). This is important as it may reveal something of the movement of people through the landscape in the contact period. Did contact with Macassan traders and, later, with British explorers and settlers impact upon traditional movement of people through the landscape? If contact rock art featuring introduced subject matter is an accurate indicator of this movement then our research suggests that a change is occurring at this time. For example, during the contact period, there is an intensification of occupation at the three major site complexes discussed in this paper and a general trend of limiting occupation and the painting of rock art throughout the rest of this part of the Wellington Range. However, one problem with this argument is that our research has demonstrated that much contact art is 'undetectable' unless it is shown in relation to introduced subject matter or dated to the contact period. In other parts of the range detailed analyses will be needed before the full picture about the importance of particular complexes such as Djulirri, Malarra and Bald Rock is known.

To expand upon this idea further it is worth considering the wider archaeological context of this study. During 2008 and 2009, 273 Indigenous archaeological sites (consisting of rock art, rockshelters, artefact scatters, scarred trees, stone quarries, shell middens, and shell scatters) were recorded in the region. This includes new dates for the earliest evidence for Indigenous occupation of the Wellington Range at 31,620±350 BP (R32137/3) and evidence of occupation until at least the 1960s.

Our wider research in the Wellington Range and the associated coastal region also shows a significant reorganisation of local residential mobility strategies over the last 250 years which can be compared against a backdrop of 31,000 years of occupation. This residential mobility is reflected in the occupation of rockshelters as well as the distribution of pre- and post-contact rock art. We would argue that a significant shift occurred to take advantage of the new economy and restructured Indigenous land-use in a way that also strengthened traditional practices but created new social capital. For instance, participation in the trepang industry required a major shift of time commitments and labour distribution by Indigenous communities that would have normally concentrated on other traditional undertakings.

The wider archaeological context always reveals a major departure from the occupation of many sites to occupation of just a few strategic sites in the Wellington Range. Within a short period of time, probably during the late AD 1600s (as evidenced by the placement of a beeswax figure dating from AD1624–1674 over a painting of a prau at Djulirri), Indigenous groups had significantly changed their residential mobility patterns. We argue that the contraction of residential mobility probably occurs for several reasons including:

- To carefully control access to Macassans and corridors of movement.
- To be situated at locations best suited for meeting with other Aboriginal groups to facilitate trade and exchange and other traditional commitments.
- To control the flow of items into the traditional economy.

To introduce new technologies and materials (such as glass, metal etc) to improve the ability to extract more resources from local environments which, in turn, sustain longer periods of occupation and larger groups at these nodes.

The changes probably took place very rapidly in response to contact and resulting participation in the trepang industry. Indigenous life after Macassan contact would have begun with a period of instability as Indigenous communities reorganised themselves and their worldview to take into account the new opportunities and situations presented to them. Out of this a modified social and economic order would have been developed incorporating the new social capital being generated from participation in the Macassan trepang industry, thus strengthening traditional lifeways and practices rather than diminishing them. Indigenous control of access and negotiation in the trepang industry was probably a unique circumstance in recent Australian history.

The archaeological evidence suggests that the technologies and customs that were sought after and acquired from Macassans were those that would benefit and strengthen traditional customs and practices. In more recent times a similar approach can be seen in the development of hybrid economies where Indigenous communities have embraced modes of participation, for example, Indigenous ranger programmes, as a way of being able to maintain and strengthen traditional customs and practices.

The complexes of rock art recorded for this research highlight key locations for this new movement across the landscape. This includes places located between the sites of contact with Macassans, missionaries and others. Paddy Cahill's station at

Oenpelli (later the CMS Anglican Mission), the Goulburn Island Methodist mission, and Macassan trepang processing sites are just some of the places that were of concern to local people – sites to which they often journeyed for visits, to trade or just to observe. For example, Esther Manakgu recalls that as a child (in the 1920s) her father heard about a settlement at Oenpelli and journeyed there himself to 'see what was going on'. He later returned to collect his family and take them to the settlement to 'see for themselves' (May 2008). This issue of shifting movement in the contact period is an exciting area of ongoing research that links rock art with archaeological excavation and local Indigenous histories.

## Conclusions

One of the key aims for *Picturing Change* is to explore the nature of contact through rock art. What then do the Malarrak, Djulirri and Bald Rock art complexes tell us about the contact period in northwestern Arnhem Land? Research to date emphasises three key points. The first is that traditional protocols for rock art continued long after first contact. This in itself attests to the strength of these cultural traditions. The second point is that when compared to the other areas of interest for our study (Wollemi National Park, the Pilbara region, and Central Australia) there is a particularly large concentration of contact rock paintings depicting introduced subject matter in this region. Yet much of the contact art at the three complexes documented in the Wellington Range is painted in 'pre-contact' styles and depicts traditional subject matter.

Finally, by documenting these sites we can start to understand the shifting movements of people through the landscape as a result of contact. We have just scratched the surface of the information that contact rock art can tell us about these periods of time. In 2008 senior traditional owner Ronald Lamilami described to us that these rock art sites were like his people's history books. His generosity in sharing these books with us will help wider Australia understand this shared history and give greater voice to Indigenous perceptions of this important time period.

## Acknowledgements

We thank Ronald Lamilami and his family for their support, guidance and enthusiasm throughout fieldwork in 2008 and 2009. *Picturing Change* is funded by ARC Discovery Grant DP0877463 and we acknowledge June Ross and Alistair Paterson as fellow Chief Investigators on this project. Much of our fieldwork in the Wellington Range has been undertaken in conjunction with Sue O'Connor and Daryl Guse's ARC-funded project (LP0882985) 'Baijini, Macassans, Balanda, and Bininj: Defining the Indigenous Past of Arnhem Land through Culture Contact'. Many of the ideas for this paper were developed during conversations around the camp fire and we thank the many volunteers who assisted us in recording rock art complexes in 2008 and 2009. While we cannot name everyone we would like to highlight the contributions of Melissa Johnson, Ines Domingo Sanz, Janet and Phil Davill, Wayne Brennan, Kirsten Brett and Michelle Langley who spent weeks at these sites helping to produce a detailed recording of each and every painting. Stewart Fallon has been undertaking the radiocarbon dating of beeswax samples from these sites and we thank him for his collaboration. Finally we

would like to acknowledge our own institutions, the Australian National University and Griffith University, for their support of our rock art research.

## References

- Bahn, P.G. and J. Vertut 1997 *Journey through the Ice Age*. London: Weidenfeld and Nicholson.
- Brody, A. 1984 *Kunwinjku Bin: Western Arnhem Land Paintings from the Collection of the Aboriginal Arts Board*. Melbourne: National Gallery of Victoria.
- Chaloupka, G. 1993 *Journey in Time: The 50,000-year Story of the Australian Aboriginal Rock Art of Arnhem Land*. Chatswood: Reed.
- Clarke, A. 1994 *Winds of Change: An Archaeology of Contact in the Groote Eylandt Archipelago, Northern Australia*. Unpublished PhD thesis, Australian National University, Canberra.
- Clarke, A. and U. Frederick 2006 Closing the distance: Interpreting cross-cultural engagements through indigenous rock art. In I. Lilley (ed.), *Archaeology of Oceania: Australia and the Pacific Islands*, pp.116-133. Oxford: Blackwell Publishing.
- David, B. and M. Wilson 2002 Spaces of resistance: Graffiti and indigenous place markings in the early European contact period of northern Australia. In B. David and M. Wilson (eds), *Inscribed landscapes: Marking and Making Place*, pp.42-60. Honolulu: University of Hawai'i Press.
- Frederick, U. 1997 *Drawing in Differences: Changing Social Contexts of Rock Art Production in Watarrka (Kings Canyon) National Park, Central Australia*. Unpublished PhD thesis, Australian National University, Canberra.
- Frederick, U. 1999 At the centre of it all: Constructing contact through the rock art of Watarrka National Park, central Australia. *Archaeology in Oceania* 34(3):132-144.
- Keyser, J.D. and M. Klassen 2003 Every detail counts: More additions to the Plains biographic rock art lexicon. *Plains Anthropologist* 48(184):7-20.
- Klassen, M. 1998 Icon and narrative in transition: Contact-period rock-art at Writing-On-Stone, southern Alberta, Canada. In C. Chippindale and P.S.C. Taçon (eds), *The Archaeology of Rock-Art*, pp.42-72. Cambridge: Cambridge University Press.
- Klassen, M., J.D. Keyser and L. Loendorf 2000 Bird Rattle's petroglyphs at Writing-On-Stone: Continuity in the biographic rock art tradition. *Plains Anthropologist* 45(172):189-201.
- Lamilami, L. 1974 *Lamilami Speaks*. Sydney: Ure Smith.
- Layton, R. 1992 *Australian Rock Art: A New Synthesis*. Cambridge: Cambridge University Press.
- Macknight, C.C. 1969 *The Macassans: A Study of the Early Trepang Industry along the Northern Territory Coast*. Unpublished PhD thesis, Australian National University, Canberra.
- MacKnight, C.C. 1986 Macassans and the Aboriginal past. *Archaeology in Oceania* 21:69-75.
- May, S.K. 2008 *Esther Manakgu Oral History* [Video]. Kunwinjku Language Project.
- McNiven, I.J. and L. Russell 2002 Ritual response: Place marking and the colonial frontier in Australia. In B. David and M. Wilson (eds), *Inscribed Landscapes: Marking and Making Place*, pp.27-41. Honolulu: University of Hawai'i Press.
- Molyneux, B. 1989 Post-contact Micmac rock art. In H. Morphy (ed.), *Animals into Art*, pp.193-214. London: Unwin Hyman.
- Mountford, C.P. (ed.) 1956 *Records of the American-Australian Scientific Expedition to Arnhem Land I: Art, Myth and Symbolism*. Melbourne: Melbourne University Press.
- Ouzman, S. 2003 Indigenous images of a colonial exotic: Imaginings from Bushmen southern Africa. *Before Farming* 1(6):239-256.
- Ouzman, S. and J. Loubser 2000 Art of the apocalypse: Southern Africa's Bushmen left the agony of their end time on rock walls. *Discovering Archaeology* November/December:38-44.
- Ouzman, S. and B. Smith 2004 Taking stock: Identifying Khoekhoen herder rock art in southern Africa. *Current Anthropology* 45(4):499-526.
- Roberts, D. 2004 Nautical themes in the Aboriginal rock paintings of Mount Borradaile, western Arnhem Land. *The Great Circle* 26(1):19-50.
- Taçon, P.S.C., M. Langley, S.K. May, R. Lamilami, W. Brennan and D. Guse in press Ancient bird stencils discovered in Arnhem Land, Northern Territory, Australia. *Antiquity* 84 (324):416-427.
- West, M. (ed.) 1995 *Rainbow Sugarbag and Moon, Two Artists of the Stone Country: Bardayal Nadjamerrek and Mick Kubarkku*. Darwin: Museum and Art Gallery of the Northern Territory.

- D. Taçon, P. May, S. Fallon, S. M. Travers, D. Wesley, and R. Lamilami, 2010. A Minimum Age for Early Depictions of Southeast Asian Praus in the Rock Art of Arnhem Land Northern Territory. *Australian Archaeology* 71:1-10.

# A MINIMUM AGE FOR EARLY DEPICTIONS OF SOUTHEAST ASIAN PRAUS

## in the Rock Art of Arnhem Land, Northern Territory

Paul S.C. Taçon<sup>1</sup>, Sally K. May<sup>2</sup>, Stewart J. Fallon<sup>3</sup>, Meg Travers<sup>2</sup>, Daryl Wesley<sup>4</sup> and Ronald Lamilami<sup>5</sup>

### Abstract

In 2008, we began two related research projects that focus on recent Australian rock art, made after the arrival of Asians and Europeans, in part of northwest Arnhem Land's Wellington Range. This area has extensive and diverse rock art, including many examples of paintings that reflect contact between local Aboriginal people and visitors to their shores. At some sites figures made of beeswax are found superimposed under and over paintings, thus providing a means of obtaining minimum and maximum ages for pigment art. We report on the results of an initial radiocarbon beeswax dating programme at the Djulirri site complex. Results include the earliest age for a depiction of a Southeast Asian watercraft in Australian rock art, which is also Australia's earliest contact period rock art depiction discovered so far. Based on the probability distribution of the calibrated ages, it is 99.7% probable this image dates to before AD 1664 and likely is much older. The significance of this result is discussed in relation to early contact history, as revealed by historic documents and archaeological excavation. Other important results suggest a close encounter between local Aboriginal people and Europeans occurred in the 1700s, before British exploration and settlement in the Arnhem Land region.

### Introduction

Arnhem Land is renowned for its extensive painted rockshelters, including some which are home to the most recent rock art of northern Australia (Chaloupka 1993; Chippindale and Taçon 1998; Lewis 1988; Taçon 1989). The Wellington Range study area (Figure 1), south of South Goulburn Island, is a particularly significant place for rock art in Arnhem Land, with many recent sites, unique contact period imagery and highly variable subject matter (May *et al.* 2010). As the northernmost outlier of the Kombolgie Sandstone that forms the famous Arnhem Land Plateau, there are many shelters with contact subject matter associated with Macassans and Europeans visiting the Arnhem coast.

Since mid-2008, over 200 art sites in the centre of the Wellington Range have been documented as part of two ARC-



Figure 1 Map of western Arnhem Land with the Wellington Range study area and the location of Djulirri indicated.

funded projects. The first, *Picturing Change*, focuses on rock art produced during the 'contact' period (i.e. the period in which Aboriginal Australians began contact with visitors to their lands). While *Picturing Change* involves fieldwork in four key regions (Wollemi National Park, the Pilbara of Western Australia, central Australia, and western/northwestern Arnhem Land), this paper focuses on attempts to date contact imagery from Arnhem Land only and the significance of these findings to this Australia-wide initiative. The second project, *Bajjini, Macassans, Balanda, and Bininj: Defining the Indigenous Past of Arnhem Land through Culture Contact*, is more focused on the Wellington Range and nearby coast. Besides rock art study, this project includes new excavations of rockshelters and Macassan stone lines. The dating of contact rock art imagery is central to both projects.

Djulirri is the largest art site documented in the Wellington Range. It forms part of the Maung language group's traditional territory and is located at the western side of senior traditional owner Ronald Lamilami's clan estate. Djulirri is considered one extremely large site by Aboriginal traditional owners. Each panel is less than 25m from its neighbour, close enough to be considered part of the same site from an archaeological point of view. Photographer Axel Poignant was taken to the site by Lamilami's father, Lazurus, in 1952 (Lamilami 1974; Poignant 1995). During this visit, most likely the first by any non-Indigenous person, Poignant photographed key rock paintings shown to him by Lazurus and was told of their significance. In the 1970s, George Chaloupka (1993) photographed and described parts of Djulirri's main panels but further research did not take place until 2008 when an intensive recording programme of the entire site commenced (see May *et al.* 2010; Taçon *et al.* 2010). Across a 55m length of dissected sandstone, Djulirri's main gallery was

<sup>1</sup> School of Humanities, Gold Coast Campus, Griffith University, QLD 4222, Australia p.tacon@griffith.edu.au

<sup>2</sup> School of Archaeology and Anthropology, Research School of Humanities and the Arts, The Australian National University, Canberra, ACT 0200, Australia sally.may@anu.edu.au, u4129920@anu.edu.au

<sup>3</sup> Research School of Earth Sciences, The Australian National University, Canberra, ACT 0200, Australia stewart.fallon@anu.edu.au

<sup>4</sup> Archaeology and Natural History, School of Culture, History and Language, College of Asia and the Pacific, The Australian National University, Canberra, ACT 0200, Australia daryl.wesley@anu.edu.au

<sup>5</sup> Kakadu Health Services, PO Box 721, Jabiru, NT 0886, Australia ronaldlamilami@hotmail.com



**Figure 2** Ronald Lamilami and Paul Taçon collecting Djulirri beeswax samples superimposed on top of the tall ship, September 2008 (Photograph: Sally K. May). A third beeswax pellet located underneath the ship was collected from higher up the panel in 2009.

found to contain more than 1100 paintings, 17 stencils, one print, and 46 figures made from native beeswax in three adjacent wall/ceiling areas (May *et al.* 2010). There are a further 52 panels with at least another 2000 examples of rock art, making it the largest known pigment site yet documented in Australia. The site is arranged in a horseshoe-like shape measuring c.180m by 120m, oriented roughly northwest-southeast, with a cluster of other sites nearby.

Paintings made with combinations of red, yellow, white and black pigment, typical of the region's recent rock art, including introduced contact period subject matter, are concentrated in Djulirri's main shelter and the rest of the southern wing of the horseshoe. Representative subject matter of all previous forms and styles, as differentially defined by Chaloupka (1993), Chippindale and Taçon (1998) Lewis (1988), and Taçon (1989), is concentrated in the northern wing, with a few mixed panels towards the back. It is within the main shelter that most of the beeswax art can also be found. A few of these designs lie over or under painted depictions of watercraft, including European tall ships and Southeast Asian sailing vessels (praus). As the dating of beeswax rock art has been shown to be both highly accurate and reliable (e.g. Bednarik 2001; Nelson 2000; Taçon *et al.* 2004), samples were obtained from a number of Djulirri figures with the intention of not only precisely dating those beeswax images but also obtaining minimum or maximum ages for diagnostic contact period paintings superimposed over or under the beeswax figures.

### Beeswax Rock Art Dating Programme

Beeswax designs, made from the highly resinous 'wax' of native bees, are found in rockshelters across the north of the Northern Territory (Nelson 2000) and in the Kimberley region of Western Australia (Morwood *et al.* 2010). They are usually small, less than 30cm x 20cm, but occasionally cover 1m<sup>2</sup> of a shelter's wall or ceiling. Most designs are geometric, often consisting of lines or parallel lines of small pellets (rounded blobs that when pressed onto the rock surface resemble raised dots). Occasionally strips, small sheets and/or pellets were used to form bird tracks and figurative motifs. Human-like figures are common but sometimes animals, objects and

mythical beings were portrayed (Gunn and Whear 2008; Nelson 2000; Taçon *et al.* 2004). Beeswax designs were usually made soon after wax was collected (Nelson 2000; Taçon and Garde 2000). Thus they are ideal for radiocarbon dating not only because they contain much carbon from a known source but also because the production of imagery was close to the onset of radioactive decay.

Brandl (1968) was the first to recognise the potential of dating beeswax rock art designs but it was not until the 1990s that the first dating attempts were made (Nelson *et al.* 1993, 1995), sparking an intensive dating programme across the Top End of the Northern Territory (Nelson 2000; Taçon *et al.* 2004). Early beeswax studies dated beeswax figures themselves, although their potential for dating overlying and underlying painted figures was acknowledged. More recent studies have tried to better link dating attempts to chronological change in both pigment and beeswax imagery (e.g. Gunn and Whear 2008; Morwood *et al.* 2010). About 200 separate beeswax figures have now been radiocarbon dated (Langley and Taçon 2010).

The oldest beeswax dates obtained from both Arnhem Land and the Kimberley are close to 4000 BP (Nelson *et al.* 1995; Morwood *et al.* 2010; Watchman and Jones 2002). However, most beeswax dates, from the north Kimberley across to central Arnhem Land, are less than 2000 years, with 90% less than 650 years. This appears to be related to taphonomy, although there may have been various peaks and declines in beeswax art production (Bednarik 2001). Taçon *et al.* (1997:958) argue that specific contact period beeswax motifs relate to sorcery in the Keep River region while Gunn and Whear (2008) used beeswax dating to show that depictions of Namarrkon, the Lightning Man, go back at least 150 years.

### Djulirri Sampling and Analysis Methodology

On 28 September 2008, seven small samples of beeswax were obtained by Taçon and Lamilami from five Djulirri figures for dating (Figure 2). All were cut from the wall with a sterile scalpel and captured with a tray lined with fresh aluminium foil. Samples were then transferred to individual foil packets, given unique codes and placed in plastic bags. These samples were processed and dated at the SSAMS Radiocarbon Dating Centre of The Australian National University, Canberra. Three further samples were taken on 20 August 2009 for cross-checking.

The 2008 samples consisted of two pieces of beeswax (WRDJ-1, WRDJ-2) from a human figure covered by a yellow and orange painting of an emu; two beeswax pellets (WRDJ-3, WRDJ-4) over a painting of a European tall ship; one piece of beeswax (WRDJ-5) from a beeswax figure that has hands on hips and wears a hat; one piece of beeswax (WRDJ-6) from a snake that overlies a large yellow painting of a prau; and a final piece (WRDJ-7) from a female human-like figure over a white painting of a prau. The motifs identified as 'praus' are argued to be depictions of Southeast Asian sailing vessels, rather than Chinese junks or European watercraft, because of their distinctive tripod masts (*pulayarang* in Makassar) and rectangular sails (*sombala*) (see Chaloupka 1996:137). In 2009, a piece of beeswax (WRDJ-8) was obtained from a beeswax line above the beeswax snake and over the white prau and a second piece (WRDJ-9) was sampled from part of the beeswax snake that is on top of the



**Table 1** Radiocarbon age determinations from beeswax sampled at Djulirri.

Sample	Lab. No. (SANU-)	Age BP	Median Age (cal AD)	Calibrated Age (cal AD)	Probability (95.4%)
WRDJ-1 (beeswax human figure under painted emu)	6816	240±25	1662	1529-1539 1634-1677 1765-1800 1940-1951	1.2% 63.8% 30.9% 4.1%
WRDJ-2 (beeswax human figure under painted emu)	6817	195±25	1773	1653-1684 1733-1807 1929-1952	24.2% 57.4% 18.3%
WRDJ-3 (beeswax pellet from unidentifiable design over painting of European tall ship)	6810	165±20	1765	1666-1694 1727-1784 1795-1813 1839-1841 1853-1858 1862-1866 1918-1952	17.9% 48.9% 10.7% 0.4% 0.6% 0.5% 20.9%
WRDJ-4 (beeswax pellet from unidentifiable design over painting of European tall ship)	6811	175±20	1767	1664-1690 1729-1788 1791-1810 1925-1952	19.1% 50.4% 10.9% 19.6%
WRDJ-5 (beeswax human figure with hat and hands on hips)	6812	190±25	1772	1654-1686 1731-1808 1927-1952	22.4% 58.7% 18.9%
WRDJ-6 (beeswax pellet from large snake over yellow painting of a prau)	6813	280±25	1577	1517-1595 1618-1664 1788-1791	55.0% 44.7% 0.3%
WRDJ-7 (beeswax pellet from a female human-like figure over white painting of a prau)	6814	220±25	1777	1644-1681 1738-1752 1762-1802 1937-1951	42.8% 2.9% 44.2% 10.2%
WRDJ-8 (beeswax pellet from a beeswax line above snake and over white painting of a prau)	10039	210±25	1779	1647-1682 1737-1758 1761-1804 1936-1951	33% 7.3% 45.0% 14.7%
WRDJ-8r (same as above)	10312	165±25	1769	1665-1696 1725-1786 1792-1814 1835-1877 1917-1952	17.7% 43.6% 11.2% 7.0% 20.5%
WRDJ-9 (beeswax pellet from large snake over yellow painting of a prau)	10206	230±25	1682	1641-1680 1740-1741 1763-1801 1938-1951	53.3% 0.3% 39.5% 7.0%
WRDJ-9r (same as above)	10313	225±30	1769	1642-1684 1739-1744 1763-1802 1938-1951	48.0% 1.0% 42.3% 8.7%
WRDJ-10 (beeswax pellet from unidentifiable design under painting of European tall ship)	10205	285±25	1568	1515-1598 1617-1662	61.1% 38.9%
WRDJ-10r (same as above)	10314	275±25	1625	1521-1591 1620-1665 1785-1793	47.0% 51.0% 2.0%

**Table 2** Reproducibility of Canberra bulk beeswax sample collected in 2007.

Sample	SSAMS ANU ID	F <sup>14</sup> C%
WAXSTD-1	6807	108.27±0.29
WAXSTD-2	6809	108.66±0.32
WAXSTD-3	6407	108.90±0.50
WAXSTD-4	6409	108.89±0.40
WAXSTD-5	6410	109.11±0.36
WAXSTD-6	10315	108.21±0.36
WAXSTD-7	10404	108.74±0.31



**Figure 3** Painting of a European tall ship, most likely made in the 1700s according to dating results (SANU-6810, SANU-6811, SANU-10205, SANU-10314) (Photograph: Paul S.C. Taçon). Note detailed rigging but lack of sails, suggesting the ship anchored off the coast.



**Figure 4** Beeswax figure with hands on hips and wearing a hat, probably made in the 1700s (1654–1808, median age 1772; SANU-6812). Note that mud wasp nests overlie the figure (Photograph: Paul S.C. Taçon).

yellow prau's mast. A beeswax pellet (WRDJ-10) was also taken from an unidentifiable design superimposed under the tall ship sampled in 2008.

### Radiocarbon Preparation

Sample pre-treatment followed the protocol set out by Nelson (2000). Wax samples were removed from the foil packs in the laboratory and examined for particulate contaminants and transferred into clean glass vials and weighed. A subsample weighing ~10mg was submerged in 0.25N HCl overnight at ~23°C. This removed the acid soluble contaminants. The samples were then rinsed with 18MΩ water and placed in 0.05N NaOH for 2 hours. The solution was removed and the

process was repeated. The samples were further rinsed with 18MΩ water then subjected to an additional 0.25N HCl rinse to remove any carbonate formed during the NaOH cleaning step. The remaining sample was then rinsed 3 times in 18MΩ water and dried overnight in a vacuum freeze drier. Around 3mg of sample material was loaded into a quartz tube with a piece of silver wire and CuO. The tube was then sealed under vacuum and the sample combusted at 900°C for 4 hours.

The CO<sub>2</sub> (~1mg carbon) was then converted to graphite in the presence of Fe powder and H<sub>2</sub> gas (water being removed during reaction with Mg(ClO<sub>4</sub>)<sub>2</sub>). Samples were run on the Single Stage Accelerator Mass Spectrometer (SSAMS) at the Research School of Earth Sciences, The Australian National University. Samples were normalised to Oxalic Acid-I and a coal blank was subtracted from the individual samples.

### Radiocarbon Dating Results

Radiocarbon ages are reported in Table 1. They were calibrated to calendar ages using Calib 6.0 (Stuiver and Reimer 1993) and IntCal09 (Reimer *et al.* 2009). Median ages were calculated using OxCal 4.1 (Bronk Ramsey 2009) and IntCal09. Duplicate samples were run on beeswax collected from the Djulirri panel in 2009 (WRDJ-8, -9, -10). Seven measurements of local (modern) beeswax, collected in Canberra, Australia in 2007, were run as a control (Table 2). These returned consistent ages showing the robustness of the beeswax sample preparation for AMS radiocarbon analysis.

As can be seen in Table 1, the results for samples of beeswax taken from different parts of the human-like beeswax figure superimposed underneath the yellow and orange emu (SANU-16, SANU-17) are consistent with each other, indicating the emu painting was made sometime after between AD 1634 and 1807 (94.7% for SANU-6816; 81.6% for SANU-6817) and, based on median ages, probably after between 1662 and 1773. This is important as it provides a chronological date for part of the most recent Djulirri rock art sequence, enabling us to determine the approximate age of several styles that immediately precede or follow the emu.

The samples taken from under the tall ship (SANU-10205, SANU-10314; Figure 3) indicate the painting can be no older than the early 1500s to the mid-1600s (median ages of 1568 and 1625). Samples from over the tall ship (SANU-6810, SANU-6811) suggest the painting has a minimum age of between 1664 and 1813 (94.7% for SANU-6816; 81.6% for SANU-6817), and probably 1765–1767 (median ages). This is surprising as it was assumed the painting would have been made after frequent visits to the area by Europeans from 1818 onward, commencing with Phillip Parker King's ship *The Mermaid* (King 1826; Smith 1992) and a peak of activity in the late 1830s to the late 1840s when Victoria Settlement in nearby Port Essington was active (see Spillett 1972).

The early (pre-1813 and most probably 1700s) age throws open the possibility it is a depiction of a Dutch tall ship rather than a British one. For instance, Lieutenant J. Gonzalee made contact with Aboriginal people in the Gulf of Carpentaria in 1756 (Mulvaney and Kamminga 1999:423) after earlier Dutch visits along the northern shores of Arnhem Land that began with the *Arnhem* in 1623. A second, similar looking painting of a tall ship lies partly under a few layers of more recent paintings



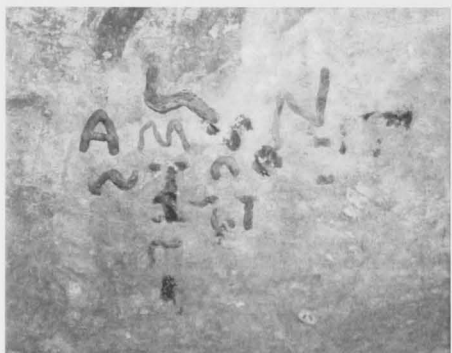
**Figure 5** Beeswax female human-like figure and line, each composed of pellets and over a white painting of a prau, dated to between 1644 and 1814 (median age 1777). This provides a minimum age for the prau (SANU-6814, SANU-10039, SANU-10312) (Photograph: Paul S.C. Taçon).



**Figure 7** Djulirri main gallery panel with large beeswax snake over yellow painting of a prau. Scale is between the white and yellow praus; the snake's head is at the far middle left (Photograph: Paul S.C. Taçon).



**Figure 6** The panel with painted Southeast Asian sailing vessels (praus), with distinctive tripod masts and rectangular sails, after manipulation with the D-stretch software programme (see Gunn *et al.* 2010). Beeswax over the larger prau (originally in yellow) was dated to between 1517 and 1664, with a median age of 1577 (SANU-6812) (digital drawing from photograph by Sally K. May).



**Figure 8** The most recent episode of beeswax art-making includes letters of the alphabet. It probably occurred in the early to mid-1900s (Photograph: Paul S.C. Taçon).

but is not superimposed by beeswax. Based on its manner of depiction (form, style, colour, technique) it likely was made at the same time as the dated ship, probably by the same artist. Whether the paintings represent the same ship, a visit by two ships at the same time or two ships visiting at slightly different times is uncertain. Both ships are shown with extensive rigging but no sails, as if anchored offshore. Given the detailed portrayal

of both the external and internal features of the ships, the artist was obviously very familiar with such vessels. There are two pink human figures wearing hats and with hands on hips shown on the deck of the dated ship that are part of the original composition. Two others in white, along with a red 'smoke stack' in the middle of the dated ship, were added later as these features can clearly be seen superimposed over the top.

The beeswax human figure with hands on hips (SANU-6812; Figure 4) was probably made between the mid-1600s and 1808 (81.1% probability; median age 1772). It is the earliest dated surviving depiction of someone from outside Arnhem Land: a European sailor, a visiting Macassan, or someone else from a foreign land. Alternatively, it could be a representation of a local Aboriginal person wearing a hat received through trade and mimicking a foreigner. However, Indigenous peoples of various parts of northern Australia and Southeast Asia often depicted Europeans at rock art sites with hands resting on their hips (e.g. for the Pilbara and Arnhem Land see Taçon *et al.* in press and for the Semang see Mokhtar and Taçon in press). Importantly, when human figures presumed to be depictions of Southeast Asians are shown on praus they do not have hands on hips. The age estimate of the beeswax figure accords well with that of the tall ship. Both images suggest a close encounter between local Aboriginal people and Europeans, probably in the 1700s.

The minimum age estimates for one of the praus was also surprising. A sample recovered in 2008 revealed that the white prau (SANU-6814; Figure 5) was probably made prior to 1802 (89.9% probability that the beeswax over it was made between 1644 and 1802, median age 1777). The yellow prau (SANU-6813; Figures 6 and 7), on the other hand, is much older. Results indicate it was made sometime prior to 1664 and possibly earlier than 1517 (99.7% probability that the beeswax over it was made between AD 1517 and 1664). The median age of the beeswax superimposed over the yellow prau is 1577. This is earlier than even the most liberal estimates of when Macassans are thought to have first begun trepanging in northern Australia (see discussion below).

Samples taken in 2009 confirm the results for the white prau (SANU-10039, SANU-10312), strongly suggesting the painting was made in the 1700s, but the beeswax pellet over the yellow prau (SANU-10206, SANU-10313) has an age statistically similar to all of the beeswax samples from over the white prau. As it is close to the beeswax line and female figure that are superimposed over the white prau it was probably placed over the yellow prau during this more recent beeswax art-making episode. The addition of beeswax to earlier images has been observed at other Arnhem Land sites with dated beeswax (e.g. Taçon and Garde 2000:72). However, results suggest there is a 50% chance the minimum age for this pellet overlying the yellow prau painting is between 1641 and 1684.

If we compare all of the ages for the beeswax sampled for dating, the results appear to indicate there were three main beeswax art-making episodes: the first between 1517 and 1595, the second between 1618 and 1694 and the third from 1727 and 1814. Alternatively, the results may also mean there was an ongoing practice of making beeswax art since at least the early 1500s. At Djulirri there was also some beeswax art-making post-1915 as beeswax was used to make letters of the alphabet that would have been learned at Mission schools (Goulbourn Island Methodist Mission was established in 1915, see Lamilami 1974; CMS Oenpelli Mission was established in 1925, see Cole 1975:18-35). These designs (e.g. Figure 8) appear much fresher and are darker in colour but were not sampled for radiocarbon dating (see Nelson 2000 for beeswax age in relation to colour, with darker beeswax invariably younger).

Importantly, beeswax from the earliest episodes are under the painting of the European tall ship but over the yellow Macassan prau. In other words, the beeswax age estimates are in sequence in relation to historically-documented events. Another important observation is that all beeswax designs dated were made after the arrival of non-Aboriginal people to Arnhem Land shores whereas further south in Arnhem Land there are much older examples of beeswax (Nelson 2000; Nelson *et al.* 1995; Taçon *et al.* 2004; Watchman and Jones 2002). It is tempting to conclude that beeswax art-making in the Wellington Range only began when groups to the south travelled up to the coast to interact with foreigners (e.g. Earl 1846; Spillett 1972), introducing the technique to the local inhabitants when they camped at particular sites together. However, more research and the dating of figures with an older appearance is needed to support this.

### Significance of Minimum Ages for Praus

One finding stands out above all others from this beeswax dating programme: a painting of a prau was found to have a minimum age of AD 1664, and could be much older. This result is in contrast to historical evidence relating to when praus from Indonesia began to visit the coast of the Northern Territory for the purpose of collecting trepang, supported by recent archival research (Macknight 2008). Other studies undertaken by a number of researchers have resulted in several contrasting views of chronology, based on documentary evidence, Indigenous narrative and excavated archaeological evidence.

Based on documentary evidence, Campbell Macknight (1976:97, 1986:69) initially placed the origins of the Macassan trepang industry between AD 1650 and 1750. However, he later revised his evaluation, arguing the industry was not in full swing until the 1780s, with some possible earlier excursions to north Australia occurring from the 1750s. Macknight's initial evaluation was based on a number of written sources which each date the industry to the eighteenth century, including historical accounts, personal journals and government records. His re-evaluation (Macknight 2008) is from evidence presented by Knapp and Sutherland's (2004) study of detailed trade data for Makassar.

In 1801, Matthew Flinders wrote that Pobasso, spokesman for a fleet of six praus whom he met in 1803, 'had made six or seven voyages from Macassar to this coast, within the preceding twenty years, and he was one of the first who came' (Flinders 1814, 2:231; Macknight 1969:376). This statement by Pobasso has been interpreted to mean that the Macassan industry began around 1783, although Englishman Alexander Dalrymple suggested the industry was in progress during the early 1760s. Specifically, according to a passage written by Dalrymple, the Macassans had already reached New Holland by 1769: 'They have penetrated to New-Holland on the south, and to Papua on the east; they also voyage to Bencoolon, Quedah, Manila, and to all the intermediate countries' (Dalrymple 1769:83; Macknight 1969:viii). Additionally, records of Captain Thomas Forrest document that 'I have been told by several Buggesses, that they sail in their Paduakans to the northern parts of New-Holland, possibly Carpentaria Bay, to gather Swallow (Biche de mer), which they sell to the annual China Junk at Macassar' (Forrest 1792:82-83; Macknight 1969:382). According to Macknight (1969:382), Forrest's records may be contemporary with that of Dalrymple's account.

The trepang 'industry' and, more specifically, Macassan or Bugis praus visiting Australia, are mentioned in sources from the eighteenth and nineteenth centuries. Conversely, accounts from earlier centuries exhibit a distinct lack of reference to the industry, i.e. accounts of the seventeenth century Dutch explorers in the area (Arnhem 1623 and Tasman 1644) make no mention of the Macassans and, as a result, no information about the industry can be inferred (Sharp 1963:52-54, 88-91; Macknight 1969:384-385). Mitchell (1994:42) and Mulvaney and Kamminga (1999:415) suggest that the first positive written reference to Macassans dates from 15 October 1754, consisting of a letter from the Governor General of the East Indies to the managers of the Dutch East India Company of Amsterdam: 'The Southland which is in the southeast of Timor not far from thence, is made now and then from Timor and Makassar, but produces so far [as] we know nothing but trepang, being dried jelly-fish, and wax' (see Mitchell 1994:42).

Although there is a lack of documentary evidence for an earlier date, Ronald and Catherine Berndt (1947) argued that the trepang industry in northern Australia must have begun in the sixteenth century based on ethnographic fieldwork. Specifically, they suggest that there was 'early Macassan or late pre-Macassan (Bajjini) contact, in perhaps the first part of the sixteenth century' (Berndt and Berndt 1947:133). Their argument appears to be based upon the significant influence of Macassans on local Aboriginal culture and language.

Earlier culture contact in the region is supported by McIntosh (1996, 2006, 2008) who reviewed Yolngu narratives regarding the Bajjini. According to McIntosh (2006) the mythological evidence points to ongoing visitation and exchange between the inhabitants of Arnhem Land and those from the Indonesian archipelago for a longer period than indicated by European records. Ganter (2006:7) supports this position stating that it is reasonable to expect that the trepang industry was 'grafted onto prior local knowledge' of the existence of resources in northern Australia. Clarke (2000a:327) suggests that although historical accounts may be correct in dating the trepang industry to the mid-seventeenth century, it is 'possible that earlier visits involved smaller numbers of people and ships, and a different range of commodities such as sandalwood, pearl shell and turtle shell that may have been sought by the Macassans or others.'

McIntosh (2008:178) proposes the Bajjini may be Bugis exiled from the Kingdom of Gowa in 1667 after Dutch occupation. The rise of the Kingdom of Gowa saw a number of attempts to secure the eastern trading routes with successive expeditions against numerous islands, including Sumbawa, Lombok, Buton and Timor (Pelras 1996:139). There was also the growing slave trade throughout the Indonesian archipelago in the 1600s which may have motivated visits to north Australia (Pelras 1996:119). And there is ample evidence of the growing seafaring capability and power of Macassans during the 1600s that would have led to expeditions to northern Australia. For instance, in 1606 Spaniards Luis Vaez Torres and Diego de Prado sailed through the Torres Strait from east to west. Near West Irian Torres encountered 'Moors', 'Islamic Traders' thought to be Buginese or Macassan (Mulvaney 1989:9-10). The serendipitous find of a Portuguese earthenware jar in Darwin Harbour, Northern Territory dated to 490 years BP  $\pm$  25% (AD 1513 $\pm$ 80) is further evidence of early visitations (*Weekend Australian* 1 April 2007).

Although Macknight is of the opinion that the trepang industry began around AD 1780 there are still problems with his archaeological evidence for Macassan visits to Australia that need to be discussed in the context of this paper. This is because radiocarbon dates on wood charcoal found in the remains of Macassan trepang boiling fireplaces returned dates several hundred years older than ages inferred by documentary evidence. The wood was assumed to be mangrove wood but the charcoal samples were not subjected to species identification. Charcoal samples with very early ages dated by Macknight (1969:388) include two from Anuru Bay, about 28km northeast of Djulirri (S.L. 7: 500 $\pm$ 75 BP [ANU-316], AD 1450; S.L. 17: 740 $\pm$ 70 BP [ANU-240], AD 1210), one from Entrance Island (buried S.L.: 830 $\pm$ 80 BP [ANU-242], AD 1120) and two from Lyaba, Groote Eylandt (S.L. 8: 430 $\pm$ 70 BP [ANU-317], AD 1520; S.L. 13: 780 $\pm$ 75 BP [ANU-241], AD 1170).

As can be seen, three geographically separate sites (Anuru Bay, Lyaba on Groote Eylandt and Entrance Island) returned radiocarbon dates with ages of approximately 500-800 BP, or AD 1170-1520 (Macknight 1976:98-99). Due to the discrepancy between these dates and historical accounts, Macknight argued that there must be a systematic source of error in the archaeological dates, although he originally stated that 'the samples themselves are all of excellent quality ... it is difficult to think of any source of contamination' (Macknight 1969:388). Macknight was also certain of the stratigraphic relationship between the dated 'mangrove' wood charcoal and the stonelines, suggesting that misidentification was impossible (Macknight 1969:390). Mitchell (1994) calibrated Macknight's radiocarbon dates using the Calib 2.0 software programme. After calibration (at 2-sigma), the dates returned age estimates as old as the eleventh century AD, and all but one occurring outside the range of documentary evidence. However, Mitchell (1994) argued that the radiocarbon dates are unreliable and that they result from technical problems with radiocarbon analysis of 'mangrove' wood. He states that there is 'specific evidence' that both 'pre-sample growth error' and 'marine reservoir effect' could influence radiocarbon dates on mangrove wood and account for the discrepancy between the historical data and these radiocarbon dates (Mitchell 1994:54-56).

Critical to 'pre-sample growth error' theory is that different parts of a long-lived perennial plant can differ in age considerably, sometimes by centuries. Specifically, the outermost growth rings of a tree would yield radiocarbon ages close to the death of the tree, while the internal hardwood of trees would return ages older than the death of the tree (Mitchell 1994:54). Mitchell (1994:54) argues that the pre-sample growth error may have 'introduced an element of bias towards excessive antiquity on some of the radiocarbon dates from Macassan sites'.

Mitchell (1994:54-56) also suggests that an oceanic reservoir correction factor needs to be taken into account due to the absorption of inorganic carbonates from inundated sediments by mangroves and the problems that arise because different carbon reservoirs can contain different initial concentrations of  $^{14}\text{C}$ . However, there appears to be no evidence to support this for mangrove wood as these trees absorb their carbon from the air like most trees and not from water. The marine reservoir effect usually occurs with shells, coral and other marine organisms (e.g. Southon *et al.* 2002; Ulm *et al.* 2009). In this regard, Clarke

(2000a:327) states that although there may be a systematic source of error in each of the radiocarbon dates 'it is clear that a more rigorous program to test these likely sources should be applied before accepting some dates and not others'. However, it is possible Macknight dated an earlier Indigenous occupation of the areas later occupied by Macassans.

In addition to the radiocarbon dates outlined above, a small pottery sherd at Dadirringka rockshelter, Groote Eylandt, was found 7cm below where a date of 930±60 BP (ANU-8984) calibrated to between 904–731 BP was obtained, providing more evidence for an earlier age for contact with outsiders (Clarke and Frederick 2009:14). Clarke (1994) found further archaeological evidence in support of early contact between Aboriginal Australians and Southeast Asians from an analysis of material excavated at Malmudinga, Groote Eylandt. Clarke observed a sequence of changes in resource use that fits in with the general direction of changes observed within known contact period middens. Clarke argues that Unit 2 at Malmudinga could be interpreted to represent an increase in the intensity and duration of site use through a greater discard rate of shell and the targeting of sand/mud shellfish species that can be attributed to contact with earlier Indonesian seafarers (Clarke 1994:181; see also Clarke 2000b:168–170). Clarke dates this early contact to between 1000 and 900 years ago at this site. However, she states that 'this initial contact was not necessarily of the order of magnitude of the later trepang industry, organised from the city of Macassar and may have been both sporadic and small scale' (Clarke 1994:470).

## Conclusions

This research not only illustrates the usefulness of dating beeswax figures to obtain minimum or maximum ages for paintings at sites with multiple layers of imagery but also has contributed to debates about when Asians and Europeans first visited Australia, as well as the impact such visits had on local inhabitants (e.g. Veth *et al.* 2008). Chaloupka (1996), Clarke and Frederick (2006, 2008) and others have highlighted the importance of depictions of Macassan vessels at north Australian rock art sites but until now there has been little confirmation of their age. The painting of the yellow prau at Djulirri made prior to AD 1664 is the oldest dated contact rock art depiction from anywhere in Australia, the oldest rock art image with Southeast Asian subject matter and some of the earliest evidence for Southeast Asian visits to northern Australia.

Ironically, archaeological excavation evidence has long pointed to this contact occurring prior to the 1700s but has generally been dismissed due to contradiction with the historical records. This reliance on historical records is unusual given that one of the strengths of archaeology is the ability to add to or contradict historical records, which are often flawed, biased, selective and missing in detail. This new archaeological evidence (i.e. a minimum age for a Southeast Asian sailing vessel, European tall ship and a depiction of a non-Aboriginal person) can complement the already existing archaeological evidence, helping to refocus debate towards a reading of the data as opposed to the manipulation of data to fit preconceived ideas of contact.

The nature of early contact between Aboriginal people and Europeans in Arnhem Land also needs reassessment as the dating

of a beeswax human figure wearing a hat and with hands on hips, as well as minimum and maximum ages for a painting of a tall ship, suggests a close encounter between local Aboriginal people and Europeans probably occurred in the 1700s and certainly before 1813. Exactly which European group – English, Dutch, Portuguese, Spanish – are possible candidates for the ship are the subject of further research.

Developing a clear understanding of when Asian and European peoples first started visiting northern Australia in the recent past is not an impossible task. There is ample archaeological evidence from which to undertake a new assessment and this study has shown that rock art clearly has a contribution to make.

## Acknowledgements

We would like to thank the Lamilami family for their support, guidance and enthusiasm throughout fieldwork from 2008 to 2010. *Picturing Change* is funded by ARC Discovery Grant DP0877463 and we would like to acknowledge June Ross and Alistair Paterson as fellow Chief Investigators on this project. Fieldwork was undertaken in conjunction with Daryl Wesley and Sue O'Connor's ARC-funded project *Baijini, Macassans, Balanda, and Bini: Defining the Indigenous Past of Arnhem Land through Culture Contact* (LP0882985). Many of the ideas for this paper were developed during camp conversations and we thank all the many volunteers who assisted us in recording rock art and undertaking wider archaeological surveys and excavations in 2008 and 2009. Michelle Langley provided some research assistance. Kelly James is thanked for radiocarbon dating assistance. The digital drawing is by Sally K. May while the map is by Mel Marshall. Four referees and the editors of *Australian Archaeology* are thanked for comments that improved the paper. Finally we would like to acknowledge our own institutions, Griffith University and The Australian National University, for their support of our research.

## References

- Bednarik, R. 2001 The taphonomy of beeswax figures. *Rock Art Research* 18(2):91–95.
- Berndt, R. and C. Berndt 1947 *Discovery of pottery in north-eastern Arnhem Land*. *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 77:133–138.
- Brandt, E. 1968 Aboriginal rock designs in beeswax and description of cave painting sites in western Arnhem Land. *Archaeology and Physical Anthropology in Oceania* 3:19–29.
- Bronk Ramsey, C. 2009 Bayesian analysis of radiocarbon dates. *Radiocarbon* 51(1):337–360.
- Chaloupka, G. 1993 *Journey in Time*. Chatswood: Reed Books.
- Chaloupka, G. 1996 Praus in Marege: Makassan subjects in Aboriginal rock art of Arnhem Land, Northern Territory, Australia. *Anthropologie* 34(1–2):131–142.
- Chippindale, C. and P.S.C. Taçon 1998 The many ways of dating Arnhem Land rock-art. In C. Chippindale and P.S.C. Taçon (eds), *The Archaeology of Rock-Art*, pp.90–111. Cambridge: Cambridge University Press.
- Clarke, A. 1994 *Winds of Change: An Archaeology of Contact in the Groote Eylandt Archipelago, Northern Australia*. Unpublished PhD thesis, The Australian National University, Canberra.
- Clarke, A. 2000a 'The Moormans Trowers': Aboriginal and Macassan interactions and the changing fabric of Indigenous social life. In S. O'Connor and P. Veth (eds), *East of Wallace's Line: Studies of Past and Present Maritime Cultures of the Indo-Pacific Region*, pp.315–335. Rotterdam: A.A. Balkema.

- Clarke, A. 2000b Time, tradition and transformation: The negotiation of cross-cultural engagements on Groote Eylandt, northern Australia. In R. Torrence and A. Clarke (eds), *The Archaeology of Difference: Negotiating Cross-Cultural Engagements in Oceania*, pp.142-181. One World Archaeology 38. London: Routledge.
- Clarke, A. and U. Frederick 2006 Closing the distance: Interpreting cross-cultural engagements through indigenous rock art. In I. Lilley (ed.), *Archaeology of Oceania: Australia and the Pacific Islands*, pp.116-133. Oxford: Blackwell Publishing.
- Clarke, A. and U. Frederick 2008 The mark of marvelous ideas: Groote Eylandt rock art and the performance of cross-cultural relations. In P. Veth, P. Sutton and M. Neale (eds), *Strangers on the Shore: Early Coastal Contacts in Australia*, pp.148-164. Canberra: National Museum of Australia Press.
- Clarke, A. and U. Frederick 2009 Making a Sea Change: Rock Art, Archaeology and the Enduring Legacy of Frederick McCarthy's Research on Groote Eylandt. Paper to Burks, Birds and Billabong Symposium, 18 November, National Museum of Australia, Canberra.
- Cole, K. 1975 *A History of Oenpelli*. Darwin: Nungalinga Publications.
- Dalrymple, A. 1769 *A Plan for Extending the Commerce of this Kingdom and of the East-India Company*. London: J. Nourse and T. Payne.
- Earl, A. 1846 On the Aboriginal tribes of the northern coast of Australia. *Journal of the Royal Geographic Society of London* 16:239-251.
- Flinders, M. 1814 *A Voyage to Terra Australis ... in the Years 1801, 1802, and 1803 ... 2 vols and Atlas*. London: G.W. Nicol.
- Forrest, T. 1792 *A Voyage from Calcutta to the Mergui Archipelago, Lying on the East Side of the Bay of Bengal ...*. London: Robson, Owen and Ballouet.
- Gantier, R. 2006 *Mixed Relations: Asian-Aboriginal Contact in North Australia*. Perth: University of Western Australia Press.
- Gunn, R.G., C.L. Ogleby, D. Lee and R.L. Whear 2010 A method to visually rationalize superimposed pigment motifs. *Rock Art Research* 27(2):131-136.
- Gunn, R.G. and R.L. Whear 2008 A singular beeswax representation of Namarrkon, the Lightning Man, from western Arnhem Land. *Australian Aboriginal Studies* 2:54-69.
- King, P.P. 1826 *Narrative of a Survey of the Intertropical and Western Coasts of Australia*. London: John Murray.
- Knapp, G. and H. Sutherland 2004 *Monsoon Traders: Ships, Skippers and Commodities in the Eighteenth Century*. Leiden: KITLV Press.
- Lamilami, L. 1974 *Lamilami Speaks*. Sydney: Ure Smith.
- Langley, M.C. and P.S.C. Taçon 2010 The age of Australian rock art: A review. *Australian Archaeology* 71:70-73.
- Lewis, D. 1988 *The Rock Paintings of Arnhem Land, Australia: Social, Ecological and Material Culture Change in the Post-Glacial Period*. BAR International Series 415. Oxford: British Archaeological Reports.
- Macknight, C.C. 1969 *The Macassans: A Study of the Early Trepan Industry along the Northern Territory Coast*. Unpublished PhD thesis, The Australian National University, Canberra.
- Macknight, C.C. 1976 *The Voyage to Marege: Macassan Trepanners in Northern Australia*. Melbourne: Melbourne University Press.
- Macknight, C.C. 1986 Macassans and the Aboriginal past. *Archaeology in Oceania* 21(1):69-75.
- Macknight, C.C. 2008. Harvesting the memory: Open beaches in Makassar and Arnhem Land. In P. Veth, P. Sutton and M. Neale (eds), *Strangers on the Shore: Early Coastal Contacts in Australia*, pp.133-147. Canberra: National Museum of Australia Press.
- May, S.K., P.S.C. Taçon, D. Wesley and M. Travers 2010 Painting history: Indigenous observations and depictions of the 'other' in northwestern Arnhem Land, Australia. *Australian Archaeology* 71: 57-65.
- McIntosh, I.S. 1996 Can we be Equal in your Eyes? A Perspective on Reconciliation from North-East Arnhem Land. Unpublished PhD thesis, Northern Territory University, Darwin.
- McIntosh, I.S. 2006 A treaty with the Macassans/Burramarra and the Dhołjji ideal. *The Asia Pacific Journal of Anthropology* 7(2):153-172.
- McIntosh, I.S. 2008 Pre-Macassans at Dhołjji? Exploring one of north-east Arnhem Land's greatest comendments. In P. Veth, P. Sutton and M. Neale (eds), *Strangers on the Shore: Early Coastal Contacts in Australia*, pp.165-180. Canberra: National Museum of Australia Press.
- Mitchell, S. 1994 *Culture Contact and Indigenous Economies on the Cobourg Peninsula, Northwestern Arnhem Land*. Unpublished PhD thesis, Northern Territory University, Darwin.
- Mokhtat, S. and P.S.C. Taçon in press The recent rock drawings of the Lenggong Valley, Perak, Malaysia. *Antiquity*.
- Morwood, M.J., G.L. Walsh and A.I. Watchman 2010 AMS radiocarbon ages for beeswax and charcoal pigments in north Kimberley rock art. *Rock Art Research* 27(1):3-8.
- Mulvaney, D.J. 1989 *Encounters in Place: Outsiders and Aboriginal Australians 1606-1985*. St Lucia, QLD: University of Queensland Press.
- Mulvaney, D.J. and J. Kamminga 1999 *Prehistory of Australia*. St Leonards, NSW: Allen and Unwin.
- Nelson, D.E. (ed.) 2000 *The Beeswax Art of Northern Australia* [CD ROM]. Burnaby: Simon Fraser University.
- Nelson, D.E., G. Chaloupka, C. Chippindale, M.S. Alderson and J.R. Southon 1993 Radiocarbon dates for beeswax figures in the prehistoric rock-art of northern Australia. *Archaeometry* 37(1):151-156.
- Nelson, D.E., C. Chippindale, G. Chaloupka, P. Taçon and J.R. Southon 1993 AMS dating of beeswax rock-art in northern Australia. *The Artefact* 16:52.
- Pelras, C. 1996 *The Bugis*. Oxford: Blackwell Publishers.
- Poignant, R. 1995 *Lost Conversations, Recovered Archives*. Tenth Eric Johnston Lecture 1995. Occasional Paper 49. Darwin: Northern Territory Government. Retrieved 3 August 2009 from [http://www.ntli.net.gov.au/\\_data/assets/pdf\\_file/0015/5262/ocpaper49\\_cj10.pdf](http://www.ntli.net.gov.au/_data/assets/pdf_file/0015/5262/ocpaper49_cj10.pdf).
- Reimer, P.J., M.G.L. Baillie, E. Bard, A. Baylis, J.W. Beck, P.G. Blackwell, C. Bronk Ramsey, C.E. Buck, G.S. Burr, R.L. Edwards, M. Friedrich, P.M. Grootes, T.P. Guilderson, I. Hajdas, T.J. Heaton, A.G. Hogg, K.A. Hughen, K.F. Kaiser, B. Kromer, F.G. McCormac, S.W. Manning, R.W. Reimer, D.A. Richards, J.R. Southon, S. Talamo, C.S.M. Turney, J. van der Plicht and C.E. Weyhenmeyer 2009 IntCal09 and Marine09 radiocarbon age calibration curves, 0-50,000 years cal BP. *Radiocarbon* 51:1111-1150.
- Sharp, A. 1963 *The Discovery of Australia*. London: Clarendon Press.
- Smith, K.V. 1992 *King Bungaree: A Sydney Aborigine meets the Great South Pacific Explorers, 1799-1830*. Kenthurst: Kangaroo Press.
- Southon, J., M. Kashgarian, M. Fontugne, B. Metivier and W.-S. Yim 2002 Marine reservoir corrections for the Indian Ocean and Southeast Asia. *Radiocarbon* 44(1):167-180.
- Spillett, P.G. 1972 *Forsaken Settlement: An Illustrated History of the Settlement of Victoria, Port Essington North Australia 1838-1849*. Doc Why West: Lansdowne Press.
- Steuer, M. and P.J. Reimer 1993 Extended <sup>14</sup>C data base and revised CALIB 3.0 age calibration program. *Radiocarbon* 35(1):215-230.
- Taçon, P.S.C. 1989 From Rainbow Snakes to 'X-Ray' Fish: The Nature of the Recent Rock Painting Tradition of Western Arnhem Land, Australia. Unpublished PhD thesis, The Australian National University, Canberra.
- Taçon, P.S.C., R. Fullagar, S. Ouzman and K. Mulvaney 1997 Cupule engravings from Jinnium-Grandpi (northern Australia) and beyond: Exploration of a widespread and enigmatic class of rock markings. *Antiquity* 71:942-965.
- Taçon, P.S.C. and M. Garde 2000 Dating beeswax figures on rock: The view from central Arnhem Land. In G. Ward and C. Tuniz (eds), *Advances in Dating Australian Rock-Markings: Papers from the First Australian Rock-Picture Dating Workshop*, pp.71-75. Occasional AURA Publication 10. Melbourne: Australian Rock Art Research Association.
- Taçon, P.S.C., M. Langley, S.K. May, R. Lamilami, B. Brennan and D. Guse 2010 Ancient bird stencils discovered in Arnhem Land, Northern Territory, Australia. *Antiquity* 84:416-427.

- Taçon, P.S.C., E. Nelson, C. Chippindale and G. Chaloupka 2004 The beeswax rock art of the Northern Territory: Direct dating results and a 'book of record'. *Rock Art Research* 21(2):155-160.
- Taçon, P.S.C., J. Ross, A. Paterson and S. May in press Picturing change and changing pictures: Contact period rock art of Australia. In J. McDonald and P. Veth (eds.), *A Companion to Rock Art*. Oxford: Blackwell.
- Ulm, S., E. Petchey and A. Ross 2009 Marine reservoir corrections for Moreton Bay, Australia. *Archaeology in Oceania* 44(3):160-168.
- Veth, P., P. Sutton and M. Neale (eds) 2008 *Strangers on the Shore: Coastal Contacts in Australia*. Canberra: National Museum of Australia.
- Watchman, A. and R. Jones 2002 An independent confirmation of the 4 ka antiquity of a beeswax figure in western Arnhem Land, northern Australia. *Archaeometry* 44(1):145-153.



## Appendix E

- E. Taçon, P. Langley, M. May, S. R. Lamilami, W. Brennan and D. Guse (Wesley), 2010. Ancient bird stencils discovered in Arnhem Land, Northern Territory, Australia. *Antiquity* 84(1):416-427.



# Ancient bird stencils discovered in Arnhem Land, Northern Territory, Australia

Paul S.C. Taçon<sup>1</sup>, Michelle Langley<sup>2</sup>, Sally K. May<sup>3</sup>,  
Ronald Lamilami<sup>4</sup>, Wayne Brennan<sup>5</sup> & Daryl Guse<sup>6</sup>



*The discovery of rare bird stencils from a unique Australian rock art complex is reported, the species they most closely resemble is discussed and their significance in terms of world rock art and climate change is highlighted.*

**Keywords:** Arnhem Land, Djulirri, rock art, stencils, bird images

## Introduction

In July 2009 five stencils of the complete body of a bird were found on the wall and ceiling of a small rockshelter that is part of an extraordinary rock art complex known to the local Maung speaking Aboriginal people as Djulirri. Located in Arnhem Land's Wellington Range (Figure 1), the site has over 3100 paintings, prints, stencils and beeswax figures, making it

<sup>1</sup> School of Humanities, Gold Coast Campus, Griffith University, Queensland 4222, Australia (Email: p.tacon@griffith.edu.au)

<sup>2</sup> School of Social Science, The University of Queensland, St. Lucia Campus, Queensland 4072, Australia

<sup>3</sup> Research School of Humanities, The Australian National University, Canberra, ACT 0200, Australia

<sup>4</sup> Kakadu Health Services, PO Box 721, Jabiru, Northern Territory 0886, Australia

<sup>5</sup> Burramoko Archaeological Services, PO Box 217, Katoomba, New South Wales 2780, Australia

<sup>6</sup> Department of Archaeology and Natural History, The Australian National University, Canberra, ACT 0200, Australia

Received: 24 September 2009; Accepted: 23 November 2009; Revised: 11 December 2009

ANTIQUITY 84 (2010): 416–427

<http://antiquity.ac.uk/ant/84/ant840416.htm>

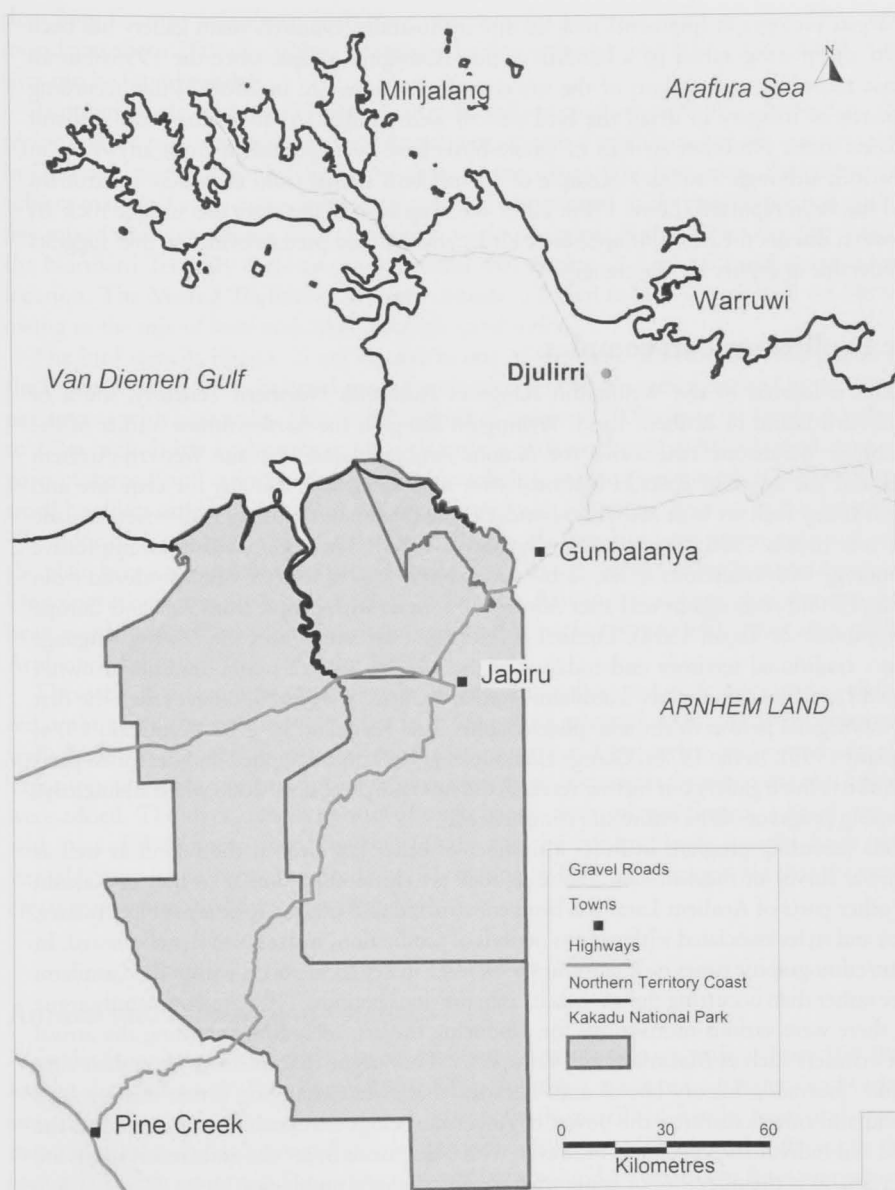


Figure 1. Location of Djulirri in Australia's Northern Territory.

the largest pictograph (pigment) rock art site in Australia. Djulirri's main gallery has been visited and photographed by a handful of non-Aboriginal people since the 1950s but an intense recording and analysis of the site complex commenced in 2008. While recording 55 panels of imagery in detail the bird stencils were located in one of the more difficult to access areas. No other stencils of whole birds have been published from anywhere in the world, although a solitary example of a small bird stencil from elsewhere in Arnhem Land has been reported (Lewis 1988: 205). We describe and illustrate this unique rock art discovery, discuss the probable species of bird stencilled and present evidence that suggests considerable antiquity for the stencils.

## **The Djulirri rock art complex**

Djulirri is located in the Wellington Range of Australia's Northern Territory, south of Goulbourn Island in Arnhem Land. Wellington Range is the northernmost outlier of the Kombolgie Sandstone that forms the famous Arnhem Land Plateau. Western Arnhem Land and the adjacent Kakadu National Park have long been famous for exquisite and extraordinary rock art with many thousands of sites documented and new discoveries made each year (Lewis 1988; Taçon 1989; Chaloupka 1993). The region boasts an impressive chronology with numerous styles, forms and subjects argued to have been produced from at least 15 000 years ago to well after Aboriginal contact with people from Asia and Europe (Chippindale & Taçon 1998). Djulirri is the largest art site within the Maung language group's traditional territory and today is at the western side of senior traditional owner Ronald Lamilami's clan estate. Lamilami's father, Lazurus, is believed to have taken the first non-Aboriginal person to the site, photographer Axel Poignant, in 1952 (Lamilami 1974; Poignant 1995). In the 1970s, George Chaloupka (1993) photographed and described parts of Djulirri's main gallery but further research did not take place until 2008 when an intensive recording program of the entire site commenced.

This recording program includes a number of other key sites in the region as well as a general survey of the Lamilami estate. A rock art chronology similar to that of Kakadu and other parts of Arnhem Land has been constructed and unique rock art subject matter, forms and styles associated with various periods of production, such as bird stencils, noted. In recent/ethnographic times rock paintings took place in key focal points within the Lamilami estate rather than occurring right across it, as in previous periods. The Lamilami family argue that there were various motivations for producing the art, including recording the arrival of newcomers such as Macassans and Europeans. They argue that in many ways their sites are like 'journals', 'history books' and 'libraries' that reflect changing times, relationships to land and other creatures, the power of Ancestral Beings that created and/or shaped the world and individual experience. However, with older forms of art the exact motivations are uncertain, as is the relevance of contemporary ontologies/cosmologies.

Across a 51m length of dissected sandstone, Djulirri's main gallery has more than 1100 paintings, stencils, prints and figures made from the resinous wax of native bees in three adjacent wall/ceiling areas. There are another 52 panels within this complex with at least a further 2000 examples of rock art, making it the largest known pigment site yet documented in Australia. The complex is considered one extremely large site because each panel is less

than 25m from its neighbour, with the entire complex arranged in a horseshoe-like shape measuring about 180m by 120m, oriented roughly northwest–southeast. A cluster of other sites can be found nearby.

Paintings made with combinations of reds, yellows and white that are typical of the region's recent rock art, including introduced contact period subject matter, are concentrated in Djulirri's main gallery and the rest of the southern wing of the horseshoe. Representative subject matter of all previous forms and styles is concentrated in the northern wing, with a few mixed sites towards the back. The site complex is unique in that across the Top End of the Northern Territory there are no other sites that display all Arnhem Land styles in one location. The Maung Traditional Owners consider Djulirri to be a virtual rock art library owing to the mix of local and other Arnhem Land styles.

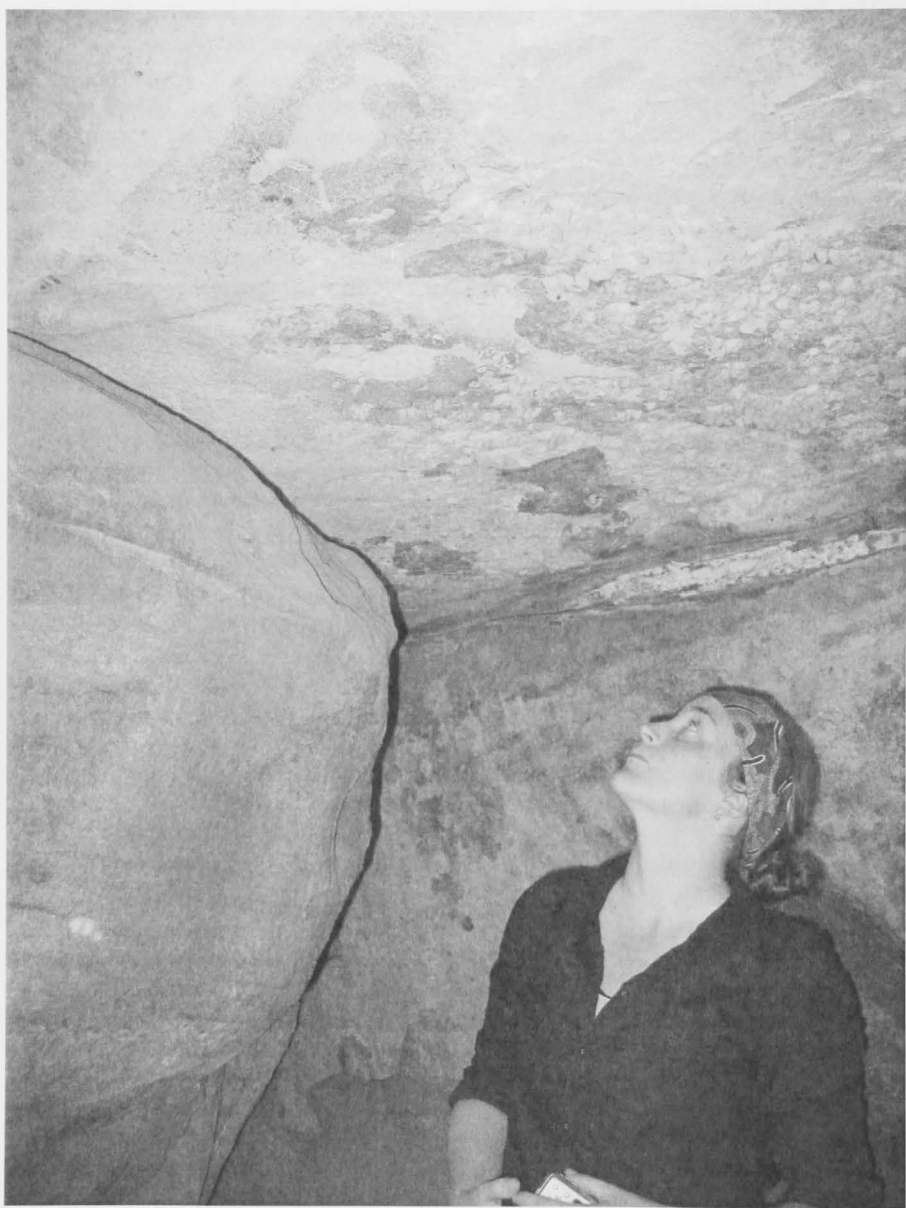
The bird stencils (Figure 2) are located in one of the more difficult to access panels of the northern wing, in a sheltered part of an eroded sandstone outlier reached by a narrow passageway with high walls. This shelter (Figure 3) measures 10.5m long by 7m deep and up to 2.8m high. It has a relatively stable rock surface with patches of a thin silicified crust on parts of the wall and ceiling surfaces, sometimes slightly overlapping stencils. There are some small boulders on the shelter floor but no major block collapse is apparent in this location. The floor does not have a deposit but some nearby shelters have excavation potential and the plain below the shelter has a deep deposit that is being considered for future excavation. Ongoing excavations by Guse at other Wellington Range sites suggest that the area has been intensively occupied for tens of thousands of years, in keeping with other areas of the Arnhem Land region (e.g. see Jones 1985).

There are 32 pictographs, consisting of 30 stencils, a yellow-red stick figure and a yellow-red outline fish, scattered across a 4.6m by 2.6m ceiling area and a 3.4m by 1.55m adjacent wall. Most of the stencils are varying shades of dark red but a few yellow-red stencils superimpose darker ones and appear to have been made more recently, when the two figures were added. The dark stencils consist of open hands, with splayed fingers, a hand stencil with two of the fingers closed together (2MF) and the five bird body stencils. Each bird stencil is exactly the same shape and size, 21cm long by 8cm wide, suggesting that the same creature was stencilled five times (Figure 4).

## Animal and human body stencils

Australia has one of the world's largest concentrations of rock art with at least 100 000 known sites (Flood 1997: ix; Taçon 2001: 534). It also has much more frequent and varied stencil art than any other country or continent, with stencils of hands, hand-and-arms, material culture and sometimes feet common in many regions. This is very different to the rock art of other countries. For instance, stencils of any kind are unknown from many parts of the world, including much of Asia and southern Africa (Bahn 1998: 115). Where they do occur hands are most common and whole animals extremely rare.

In 2009 we also found a stencil of a whole fish at the north-east end of Djulirri. The only other whole animal stencils recorded from Arnhem Land are clustered at one site far to the south of the Wellington Range, documented by Lewis (1988: 205). He reports on stencils



*Figure 2. Michelle Langley observing newly discovered bird stencils on 21 July 2009.*

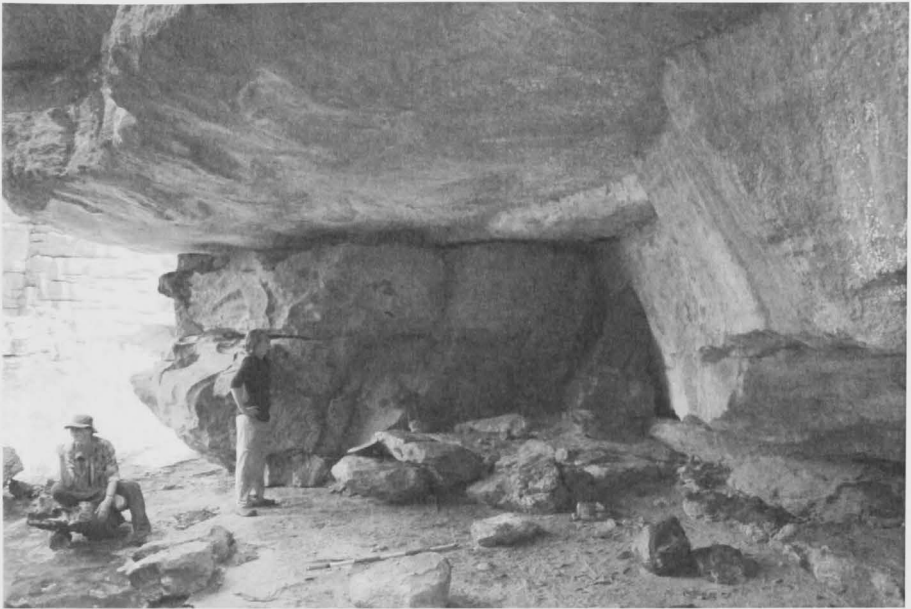
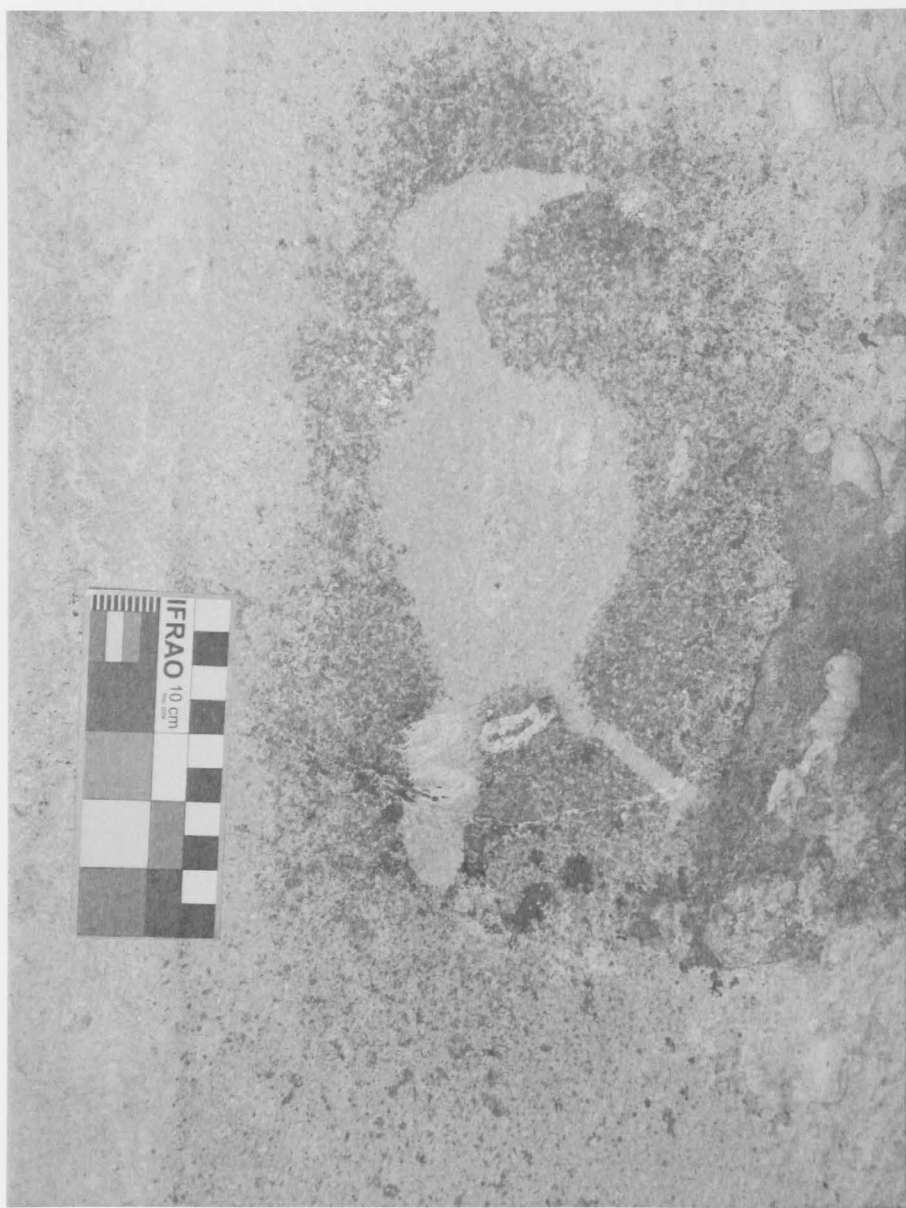


Figure 3. View of the stencil shelter.

of a possible gliding possum, a small mammal, a rat-like mammal, an animal leg and what 'appears to be a small bird'. Unfortunately, the possible bird stencil is not illustrated.

For Kakadu National Park, Taçon (1989) notes seven instances of animal body part stencils associated with recent X-ray paintings, five emu feet and two possible dingo paw stencils (see also Chaloupka 1993: 233). Eight emu foot stencils have also been documented in the Keep River region of the Northern Territory by one of us (PT). The hands, forearms, shoulders, neck and head of an adult human were stencilled at a site in Kakadu National Park (Taçon 1992: 214, fig. 8) and the whole upper torso of another adult was stencilled at a Cape York site, northern Queensland (recorded by PT, 1987). A virtually complete human body stencil has been recorded at The Tombs site, Mt Moffat Station, Queensland (Mulvaney & Joyce 1965: 195 & pl. 30). This site also has macropod leg stencils (Mulvaney & Joyce 1965: 195 & pl. 31). Nearby, at Carnarvon Gorge, stencils of emu feet, macropod feet, dog feet and snakes have been found (Quinnell 1979; Walsh 1983), as well as pieces of plants (Quinnell 1979) and shells (Beaton & Walsh 1977). Baler shell (*Melo sp.*) objects were also stencilled at The Walkunders site, north Queensland (Watchman & Hatte 1996), while a lizard and a horse hoof were stencilled at Laura (Trezise 1971) and dingo paws, bird feet and a snake were stencilled on Middle Park Station, north-west Queensland (Wade 2009: 41).

For New South Wales, McDonald (2008: 63) illustrates stencilled fish tails from a site near the confluence of Cowan Creek and the Hawkesbury River and kangaroo tails from a shelter in Wollemi National Park, north-west of Sydney. She also notes that leaves and a



*Figure 4. One of the best preserved bird stencils, on part of the ceiling that does not receive direct sunlight.*



twig were stencilled at the Great Mackerel rockshelter (McDonald 1992: 34). Sefton (1993: 63-4) recorded two 'mouse' stencils, five wallaby front feet and two wallaby back feet at sites on the Woronora Plateau, south of Sydney. Bindon (1976) documented a fish stencil and an unspecified animal foot at the nearby Shoahaven River. Officer (1984: 33) recorded two macropod feet and two emu feet in the Campbelltown Area of western Sydney while an unspecified animal foot stencil from Cobar has been reported (McCarthy 1976). Near Mootwingee there are five stencils of lizards, a bandicoot, a mammal skin and four snakes (McCarthy & Macintosh 1962; see especially 264, fig. 8).

Throughout much of Australia many items of material culture were stencilled, especially boomerangs (Morwood 2002: 165-6). Walsh (1983) argues that many designs at Carnarvon Gorge sites and elsewhere are actually stencil composites. One of the more unusual object stencils is of a small human figure 12cm high, probably made with a doll or a cut-out (Moore 1977: 319-20).

Outside Australia a stencil of a whole fish was recently found on the island of Tika, New Caledonia, by Jacques Bolé and Christophe Sand (unpublished), while guanaco hoof stencils have been documented in Argentina (Podestá *et al.* 2005: 29, 81, pl. 14). Foot stencils of large flightless birds have been reported from Papua New Guinea (cassowary, Gorecki & Jones 1988) and Patagonia in South America (ñandú or rhea, Podestá *et al.* 2005: 29, 83, pl. 15). However, most stencils outside Australia are of human hands and hands with forearms (especially in Europe, Argentina and on the island of Borneo) and these are also the most common forms of stencils within Australia (Layton 1992).

As has been demonstrated, stencils of whole animals and human bodies are very rare everywhere and, besides one reported sighting in Arnhem Land, bird stencils have not been found in any other part of Australia or anywhere else globally.

## Probable species and age of the stencils

Because of the size of the stencilled bird, its distinctive head and beak shape and the nature of its tail, a short list of probable species can be constructed. However, given the skinny neck and smooth body lines, it appears that some throat and body feathers may have been plucked prior to stencilling, making precise identification difficult. Another possibility is that the bird neck may have been stretched from being held/gripped and carried with forefinger and thumb around the neck. This would have compressed the feathers, elongating the neck somewhat. The size and shape of the head suggests the bird is probably a honeyeater. Honeyeaters are common across Australia with many species currently reported from Arnhem Land alone. Most are either larger or smaller than the stencilled bird but the Singing Honeyeater (*Lichenostomus virescens*), with a length of 18-22cm and similar shape, seems a likely candidate (see Pizzey 1985: 329, pl. 76). Today the Singing Honeyeater is rare in Arnhem Land, preferring drier environments to the south and avoiding areas of high rainfall.

This behavior and environmental preference could suggest the stencils were produced when the climate was much drier and Singing Honeyeaters presumably more common. For Arnhem Land, recent periods of aridity include the terminal Pleistocene and the mid to late Holocene (see Bourke *et al.* 2007 and Taçon & Brockwell 1995 for reviews of Arnhem Land

climate change in relation to archaeological data including rock art). The early Holocene was a wetter period while the mid to late Holocene was not only more arid but also a period of climatic variability due to the onset of ENSO conditions and wet-dry oscillations (e.g. see McGlone *et al.* 1992). The period of aridity during the terminal Pleistocene was less variable with climatic conditions similar to that of interior Australia today, the current range of the Singing Honeyeater.

This accords well with an association between the bird stencils and a hand stencil with two middle fingers (2MF) closed, as these and others with three middle fingers closed (3MF) are invariably associated with the oldest styles of rock art across Arnhem Land and other parts of northern Australia (Lewis 1988; Chaloupka 1993; Chippindale & Taçon 1998). The 3MF stencil is widespread and almost like a 'logo' for early pre-estuarine art (Flood 1997: 267) while the 2MF, although also associated with only the earliest art styles, is particular to the Wellington Range. In terms of his chronological sequence, Lewis (1988: 205) places the whole body animal stencils at a site far to the south of Djulirri in his 'Boomerang Period', arguing they are over 9000 years of age. Some of the Djulirri bird stencils have fossilised mud-wasp nests over them, again suggesting considerable antiquity for the stencils and providing potential for securing a minimum age (Roberts *et al.* 1997). Samples taken for AMS dating are in progress but all of the above suggests the bird stencils were made at least 9000 years ago, with the possibility of them being much older. Arnhem Land stencils of animals, including the Djulirri birds, are the oldest surviving animal-related stencils from anywhere. Those from elsewhere are known to be less than a few thousand or even a few hundred years of age given associated paintings and drawings, the nature of rock surfaces and regional dating programs (e.g. McDonald 2008).

## **Implications and inspirations**

Nearby these remarkable stencils another panel was documented which provided evidence for an interesting relationship between the Djulirri sites. Remarkably, amongst over 200 paintings in another Djulirri shelter, three paintings of small birds clustered together were found on a low ceiling (Figure 5). They are of a similar size and shape to the much older stencilled birds and, we would argue, depict the same species. No other paintings of small species of birds were found at the site or at any of the hundreds of sites documented across the Wellington Range. These images, in solid yellow, appear to have been painted very recently, perhaps between 50-100 years ago, given their extremely fresh appearance and their style associated with recent European contact subject matter in Djulirri's main gallery. Is it possible that the older bird stencils documented in this paper inspired an artist in recent times to replicate accurately, from memory, the birds he saw in the stencil shelter as paintings?

Stencils, especially hands and feet, have been argued to be personal and individual markers (Moore 1977; Forge 1991; Taçon 1992; Chaloupka 1993; Rosenfeld 1993; Bahn 1998: 115). Lewis (1988: 205) suggests animal body stencils made at the site he recorded could have been made by children because they are within 1.5m above ground. The five bird stencils at Djulirri, however, are about 2m above ground on the ceiling and near the top of the wall. They were well executed and the bird held in place in such a way that

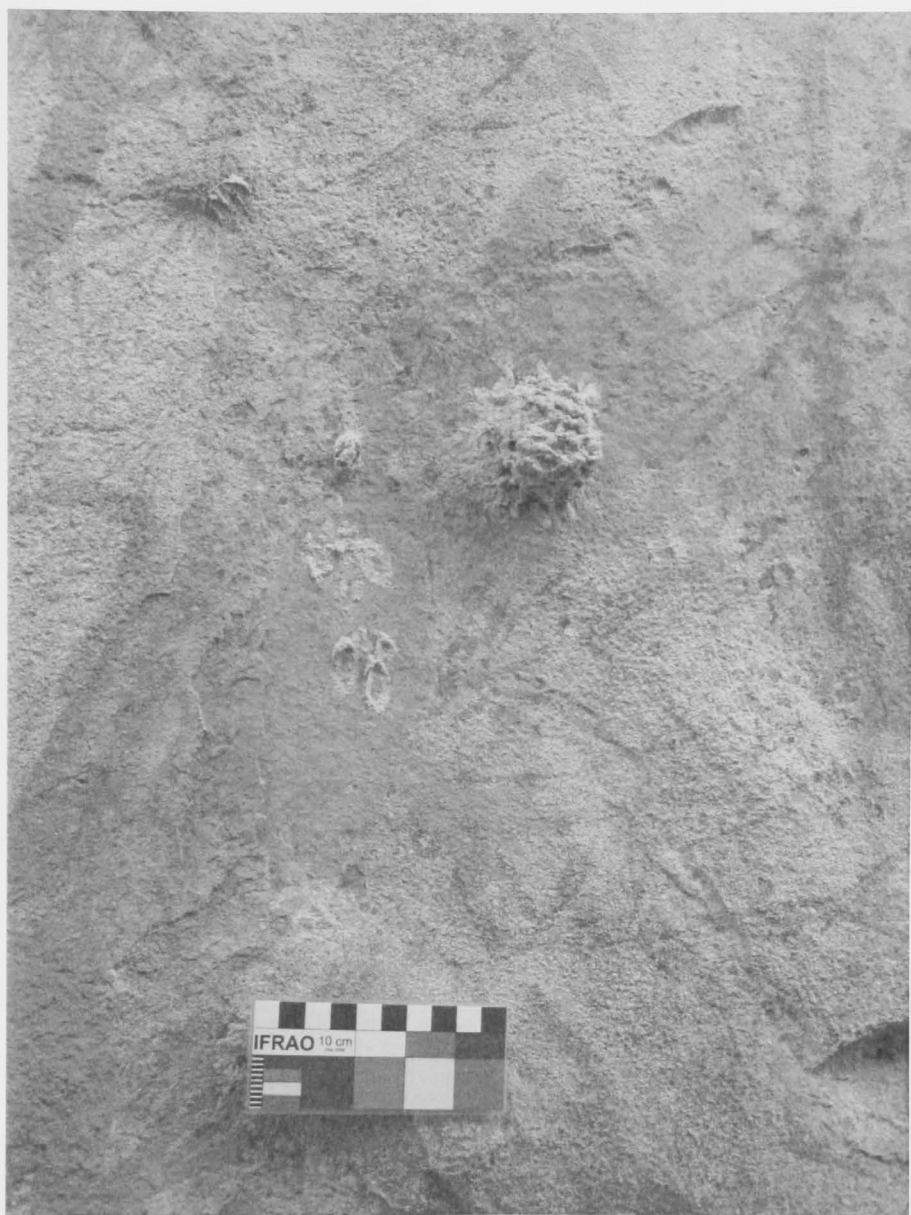


Figure 5. Two of three recently painted birds in yellow on the ceiling of a shelter about 80m from the bird stencils.

whatever held them was not stencilled. This suggests the artist had the skills and physical abilities of an adult.

We will never know why the bird was stencilled so many times in the one place. It may have been a rare treat for dinner, someone's totem species, a personal marker, a bird raised as a pet, the result of ritual, the product of an idle moment, a record of some significant event or an artistic innovation that never caught on. However, it reminds us of the long history of human interaction with and depiction of creatures both great and small. It also speaks to us about climate change and the threat to small, vulnerable species so often forgotten when human concerns dominate debate about environment and heritage.

## Acknowledgements

This research was supported by Australian Research Council (ARC) Discovery Grant DP0877463 and is part of the Picturing Change research program. It is also supported by the Baijini, Macassans, Baland, and Bininj research project and ARC Linkage Grant LP0882985. The Waminari Aboriginal community is thanked for logistical support and hospitality. The Northern Land Council is thanked for permits and advice. Jean Clottes, Sven Ouzman and Robert Bednarik are thanked for advice on the worldwide incidence of stencils. Christophe Sand, Jacques Bolé and Ian Lilley are thanked for permission to report their fish stencil discovery. Fellow Chief Investigators Sue O'Connor, Alistair Paterson and June Ross are thanked for support and collaboration on the research projects listed above. Griffith University and The Australian National University gave various forms of logistical support. Two anonymous referees are thanked for comments which improved this paper. Photographs are by P.S.C. Tacon.

## References

- BAHN, P. 1998. *The Cambridge illustrated history of prehistoric art*. Cambridge: Cambridge University Press.
- BEATON, J. & G. WALSH. 1977. Che-ka-ra. *Mankind* 11(1): 46-7.
- BINDON, P. 1976. The devil's hands: a survey of the painted shelters of the Shoalhaven River basin. Unpublished BA dissertation, The Australian National University.
- BOURKE, P., S. BROCKWELL, P. FAULKNER & B. MEEHAN. 2007. Climate variability in the mid to late Holocene Arnhem Land region, north Australia: archaeological archives of environmental and cultural change. *Archaeology in Oceania* 42(3): 91-101.
- CHALLOUPKA, G. 1993. *Journey in time*. Sydney: Reed Books.
- CHIPPINDALE, C. & P.S.C. TAÇON. 1998. The many ways of dating Arnhem Land rock-art, in C. Chippindale & P.S.C. Tacon (ed.) *The archaeology of rock-art*: 90-111. Cambridge: Cambridge University Press.
- FLOOD, J. 1997. *Rock art of the Dreamtime*. Sydney: Angus & Robertson.
- FORGE, A. 1991. Handstencils: rock art or not art, in P. Bahn & A. Rosenfeld (ed.) *Rock art and prehistory: papers presented to symposium G of the AURA Congress, Darwin 1988* (Oxbow Monograph 10): 39-44. Oxford: Oxbow.
- GORECKI, P. & R. JONES. 1988. *A new rock art province in New Guinea*. Canberra: Department of Prehistory, The Australian National University.
- JONES, R. (ed.) 1985. *Archaeological research in Kakadu National Park*. Canberra: Australian National Parks and Wildlife Service.
- LAMILAMI, L. 1974. *Lamilami speaks*. Sydney: Ure Smith.
- LAYTON, R. 1992. *Australian Aboriginal art: a new synthesis*. Cambridge: Cambridge University Press.
- LEWIS, D. 1988. *The rock paintings of Arnhem Land, Australia: social, ecological and material culture change in the post-glacial period* (British Archaeological Reports International Series 415). Oxford: British Archaeological Reports.
- MCCARTHY, E.D. 1976. *Rock art of the Cobar Pedepain*. Canberra: Australian Institute of Aboriginal Studies.
- MCCARTHY, E.D. & N.W.G. MACINTOSH. 1962. The archaeology of Mootwingee, western New South Wales. *Records of the Australian Museum* 25(13): 249-98.

- MCDONALD, J. 1992. The Great Mackerel rockshelter excavation: women in the archaeological record? *Australian Archaeology* 35: 32-50.
- 2008. *Dreamtime superhighway: Sydney basin rock art and prehistoric information exchange* (Terra Australis 27). Canberra: ANU E-Press.
- MCGLONE, M.S., A.P. KERSHAW & V. MARKGRAF. 1992. El Niño/Southern Oscillation climatic variability in Australasian and South American paleoenvironmental records, in V. Markgraf & H.E. Diaz (ed.) *El Niño: historical and paleoclimatic aspects of the Southern Oscillation*: 435-62. Cambridge: Cambridge University Press.
- MOORE, D. 1977. The hand stencil as symbol, in P.J. Ucko (ed.) *Form in indigenous art*: 318-24. Canberra: Australian Institute of Aboriginal Studies.
- MORWOOD, M. 2002. *Visions from the past. The archaeology of Australian Aboriginal art*. Crows Nest: Allen & Unwin.
- MULVANEY, D.J. & E.B. JOYCE. 1965. Archaeological and geomorphological investigations on Mt. Moffat Station, Queensland, Australia. *Proceedings of the Prehistoric Society* 31: 147-212.
- OFFICER, K. 1984. From Tuggerah to Dharawal. Variation and function within a regional art style. Unpublished BA dissertation, The Australian National University.
- PIZZEY, G. 1985. *A field guide to the birds of Australia*. Sydney: Collins.
- PODESTÁ, M.M., R.S. PAUNERO & D.S. ROLANDI. 2005. *El arte rupestre de Argentina indígena Patagonia*. Buenos Aires: Grupo Abierto Comunicaciones.
- POIGNANT, R. 1995. *Lost conversations, recovered archives. Tenth Eric Johnston Lecture 1995* (Occasional Paper 49). Darwin: Northern Territory Government. Available at: [http://www.ntl.nt.gov.au/\\_data/assets/pdf\\_file/0015/5262/occpaper49\\_ej10.pdf](http://www.ntl.nt.gov.au/_data/assets/pdf_file/0015/5262/occpaper49_ej10.pdf), accessed 3 August 2009.
- QUINNELL, M.C. 1979. Schematisation and naturalism in the rock art of south central Queensland, in P.J. Ucko (ed.) *Form in indigenous art*: 415-17. Canberra: Australian Institute of Aboriginal Studies.
- ROBERTS, R., G. WALSH, A. MURRAY, J. OLLEY, R. JONES, M. MORWOOD, C. TUNIZ, E. LAWSON, M. MACPHAIL, D. BOWDERY & I. NAUMANN. 1997. Luminescence dating of rock art and mud-wasp nests in northern Australia. *Nature* 387: 696-9.
- ROSENFELD, A. 1993. The Panaramittee tradition, in M. Smith, M. Spriggs & B. Fankhauser (ed.) *Sahul in review: Pleistocene archaeology in Australia, New Guinea and Island Melanesia*: 71-80. Canberra: Department of Prehistory, RSPaC, The Australian National University.
- SEFTON, C. 1993. Stencil art on the Woronara Plateau: a description and analysis of sites and artefacts including stencils, charcoal drawings and petroglyphs. *Rock Art Research* 10(1): 61-4.
- TAÇON, P.S.C. 1989. From Rainbow Snakes to 'X-ray' fish: the nature of the recent rock painting tradition of western Arnhem Land, Australia. Unpublished PhD dissertation, The Australian National University.
- 1992. Somewhere over the rainbow: an ethnographic and archaeological analysis of recent rock paintings of western Arnhem Land, Australia, in J. McDonald & I.P. Haskovec (ed.) *State of the art: regional rock art studies in Australia and Melanesia: proceedings of symposium C 'Rock art studies in Australia and Oceania' and symposium D 'The rock art of Northern Australia' of the First AURA Congress held in Darwin in 1988* (Occasional AURA Publication 6): 202-15. Melbourne: Australian Rock Art Research Association.
- 2001. Australia, in D. Whitley (ed.) *Handbook of rock art research*: 530-75. Walnut Creek (CA): Altamira.
- TAÇON, P.S.C. & S. BROCKWELL. 1995. Arnhem Land prehistory in landscape, stone and paint. *Antiquity* 69: 676-95.
- TREZISE, P. 1971. *Rock art of south-east Cape York*. Canberra: Australian Institute of Aboriginal Studies.
- WADE, V. 2009. Style, space and social interaction: an analysis of the rock-art on middle Park Station, northwest Queensland. Unpublished BA dissertation, Flinders University.
- WALSH, G. 1983. Composite stencil art: elemental or specialized? *Australian Aboriginal Studies* 2: 34-44.
- WATCHMAN, A. & E. HATTE. 1996. A nano approach to the study of rock art: 'The Walkunders', Chillagoe, north Queensland. *Rock Art Research* 13(2): 85-92.

## Appendix F

- F. Theden-Ringl, F., Fenner, J., Wesley, D., and R. Lamilami, 2011. Buried on Foreign Shores: Isotope Analysis of the Origin of Human Remains Recovered from a Macassan Site in Arnhem Land. *Australian Archaeology* 73:41-48.

# BURIED ON FOREIGN SHORES:

## Isotope Analysis of the Origin of Human Remains Recovered from a Macassan Site in Arnhem Land

Fenja Theden-Ring<sup>1</sup>, Jack N. Fenner<sup>1</sup>, Daryl Wesley<sup>1</sup> and Ronald Lamilami<sup>2</sup>

### Abstract

This study uses strontium ( $^{87}\text{Sr}/^{86}\text{Sr}$ ), oxygen ( $\delta^{18}\text{O}$ ) and carbon ( $\delta^{13}\text{C}$ ) isotope analysis of archaeological tooth enamel samples to investigate the origins of human remains from two sites in Arnhem Land, Northern Territory: a coastal Macassan site and an Indigenous rockshelter complex. The study aims to resolve whether two individuals from the Macassan site originate from outside Arnhem Land and, if so, whether their place of origin can be determined. Strontium results confirm the Macassan and Indigenous samples represent two distinct populations. The Indigenous values match the local Arnhem Land geologic strontium signatures, while the Macassan values are outside the local range and more likely to match Indonesian geological signatures. Carbon isotope results are more equivocal, but tend to support the presence of two populations by revealing slightly different dietary backgrounds for each group. Oxygen isotope data introduce more complexity; their geographic signal may be confounded by cultural behaviour. Radiocarbon dating suggests the Macassan Anuru Bay A site is a relatively early contact site. This study shows that even with a small sample set there is potential to discern past human mobility and origin using stable isotope analysis.

### Introduction

For centuries, the northern coastline of Australia has witnessed the meeting, trading and cultural exchange of people from vastly different societies. Sailing south out of the centre of what is now Indonesia, fleets of boats called 'praus' visited the coast of northern Australia, arriving on the northwest monsoons in October and November and returning home when the southeast winds blew several months later (Berndt and Berndt 1947:133). They came to collect and process trepang, a marine animal found abundantly on the shallow seabeds off the coast. A prized ingredient in Chinese cuisine, trepang was a major item of commerce (Macknight 1976:1). The archaeological site of Anuru Bay A in northwest Arnhem Land is one of the places Macassans came to process their catch; it is a large trepang processing site with the remains of 21 lines of stone fireplaces for boiling trepang. The site is located on a sheltered peninsula on the eastern side of Anuru Bay, a low-energy sandy bay facing northeast towards the Arafura Sea (Figure 1). Originally excavated by Campbell Macknight in 1966 and 1967, the site is currently the focus of renewed archaeological work.

Macknight recovered two sets of skeletal human remains during his initial work at Anuru Bay A in 1966. The archaeological



Figure 1 Map showing the study area and the archaeological sites of Anuru Bay A and Malarraak.

context and morphology of these remains led Macknight and Thorne (1968) to identify them as Macassan rather than Aboriginal Australian in origin. In this study, strontium, oxygen and carbon stable isotope analyses of tooth enamel from these two 'Macassans' is used as an independent means of assessing whether they originate from outside Arnhem Land and if so, whether their origin may indeed be Macassan. Key to these assessments is a comparison of stable isotope ratios from the skeletons to a local signature for an Arnhem Land population. We therefore also report stable isotope ratios from three human teeth and one faunal tooth recovered from the nearby archaeological site of Malarraak. These are the first reported archaeological stable isotope ratios derived from human remains in Arnhem Land, and are therefore supplemented in the analysis with ratios from geological (Table S1, supplementary information) and hydrological reports.

Our results confirm that the two people buried at Anuru Bay A were not Aboriginal Australians from Arnhem Land and, when combined with previously reported archaeological and morphological data, analyses strongly support their identification as Macassans. There is also interesting variation within both the Macassan and Aboriginal Australian groups' isotope ratios which points toward the potential for using stable isotope analysis to more precisely identify origin locations for people and fauna recovered from archaeological sites both within Arnhem Land and Island Southeast Asia. In addition, radiocarbon dating of the enamel indicates that Anuru Bay A was occupied relatively early in the Macassan trepang period; in fact, the Anuru Bay A remains are likely to be the earliest known non-Aboriginal human skeletons from anywhere in Australia.

### Macassan Trepang Visits to Arnhem Land

Central to the current study is the identity and geographical origin of Macassans. Macknight (1976, 2008) provides an

<sup>1</sup> Archaeology and Natural History, School of Culture, History and Language, College of Asia and the Pacific, The Australian National University, Canberra, ACT 0200, Australia. fenja.theden-ring@anu.edu.au, jack.fenner@anu.edu.au, daryl.wesley@anu.edu.au

<sup>2</sup> Kakadu Health Services, PO Box 721, Jabiru, NT 0886, Australia. ronaldlamilami@hotmail.com

overview based on historic sources; for our purposes, the term 'Macassan' refers to a person on the annual fleet of praus to the Northern Territory, rather than to a particular racial, linguistic or cultural group. The crews are known to have consisted predominantly of men from the Macassarese and Bugis cultural groups of southwest Sulawesi. Macknight found that even in the twentieth century, the old men in the city of Makassar remembered the 'Macassan' trepangers as a distinct group with a close association of captains. The direct connection to southwest Sulawesi is also supported linguistically, as the Macassarese language is the most common in words borrowed into Arnhem Land languages. However, the Macassan crews do not appear to have been limited to men from southwest Sulawesi. Macknight (1976) has cited crew lists in which individuals came from various places in Indonesia including New Guinea, Java and Ceram, with further mention of crew members from Buton, Timor, Maluku and Papua. He also notes historical records indicating that, while the majority of praus were of the type from Makassar, a few were made in the styles of other places such as the island of Sumbawa.

Macassan-Indigenous relations were not limited to one-way contact in the form of Macassans visiting northern Australia. There are accounts of Aboriginal people sailing on praus, travelling to Macassar and Singapore, and living abroad for a time (Macknight 1976:86). Such adventures away from Australia were frequent occurrences for young Aboriginal men (and for women occasionally), while Macassans seem to have been less likely to remain in Australia beyond their working season. There are also several accounts of Macassans fathering children with Aboriginal women (Macknight 1976; Warner 1932).

The early chronology of contact is uncertain. Based on written sources, Macknight (1976:97) initially suggested Macassan praus began visiting northern Australia for trepang between AD 1650 and 1750, probably in the last quarter of the seventeenth century. He later revised his estimate to somewhere between early contact in the 1720s when 'the trepang trade in Macassar was still in its infancy' and 1754 when more concrete evidence was available (Macknight 2008:136). Some ethnographic evidence, based on local Aboriginal culture, language, narrative and mythology, suggests an earlier date for the beginnings of the industry, perhaps as early as the first part of the sixteenth century (Berndt and Berndt 1947:133; Taçon *et al.* 2010:7). A recently discovered pottery sherd at Groote Eylandt was found below a date of 930±60 BP (ANU-8984) (Clarke and Frederick 2009 cited in Taçon *et al.* 2010). Another study investigating the minimum age for early rock art depictions of southeast Asian praus in northwest Arnhem Land found one depiction under beeswax dated to before AD 1664 (Taçon *et al.* 2010).

### Stable Isotope Analysis

Isotopes are atoms of the same element but with differing weights. That is, they have the same number of protons but differing numbers of neutrons in the nucleus. Unlike radioactive isotopes such as  $^{14}\text{C}$ , stable isotopes do not decay over time. The ratio of heavy to light isotopes for a particular element, however, often varies across the landscape. Strontium ratios vary based on the age and composition of the underlying geology while oxygen isotope ratios depend on precipitation source and intensity, and temperature. The isotope ratios of particular places become incorporated into plants growing on the landscape, and are

carried up through the food chain until they are incorporated into human tissues. Carbon isotope ratios, on the other hand, depend on the particular photosynthetic pathway utilised by plants and are useful for distinguishing certain aspects of diet including the relative proportions of marine and terrestrial components in the diet. While not frequently applied in Australian and Indonesian archaeological situations, stable isotope analyses have become common in many other regions. A number of recent overviews of archaeological stable isotope analysis are available elsewhere (e.g. Bentley 2006; Lee-Thorp 2008; Tykot 2004). In the Island Southeast Asia-Pacific region, isotope analyses have been used archaeologically as indicators of Lapita migration in the Bismarck Archipelago (Shaw *et al.* 2009, 2010) and remote Oceania (Bentley *et al.* 2007) and in the study of Neolithic groups in Sarawak, Malaysia (Valentine *et al.* 2008).

### Strontium

The ratio of heavy and light isotopes of strontium ( $^{87}\text{Sr}/^{86}\text{Sr}$ ) for a particular place is determined by the ratio in the soil, which may be derived from rocks of different ages and lithologies. Very young rocks such as basalt and reef limestone typically have low ratios (less than 0.704) while very old continental crust rocks such as gneiss, schist and slate can have quite high ratios (well above 0.710) (Bentley 2006; Pye 2004). While geologic processes are the ultimate basis for strontium ratios, interpretation of strontium values in organic specimens by comparison to geologic information can be problematic because the strontium composition of soil and the biosphere does not usually correspond exactly with that of the underlying bedrock. Soils and sediments are products of varying compositions of the source materials from which they are derived, so strontium readings incorporated into the food chain can vary significantly from those of the bedrock beneath. When additional factors such as differential mineral weathering, leaching, seaspray, geological drift and surface additions of dust and rainwater are added to the equation, the strontium found in biological materials can be quite removed from the geological indicators of the region (Eckardt *et al.* 2009; Price *et al.* 2002; Pye 2004). Optimally, archaeologists prefer to use strontium ratios from archaeological faunal remains or humans to determine the local biologically-available strontium ratio signature for an area (Bentley 2006; Bentley *et al.* 2004; Price *et al.* 2002). Unfortunately, no biologically-available strontium ratios have been published from either Arnhem Land or likely Macassan origin islands. As discussed below, we measured strontium ratios in three human and one mammal teeth from an Aboriginal Australian archaeological site to determine the local strontium signature, and supplement this with expectations derived from geological analyses.

### Oxygen

Oxygen isotope ratios in mammals are determined by the ratios in water obtained from drinking and consuming food. They are useful for archaeological assessment of location because they are correlated with environmental variables such as temperature during precipitation and precipitation intensity, which can vary significantly between different regions (Bowen *et al.* 2005; Eckardt *et al.* 2009; Luz *et al.* 1984). Human cultural behaviour such as boiling water or using wells to obtain underground water with a different isotopic ratio can also influence oxygen isotope ratios.



## Carbon

Carbon isotope analysis is typically used to reconstruct ancient diets. The approach is based on different plant groups having a subtle difference in the fractionation of atmospheric carbon dioxide during photosynthesis (Lee-Thorp 2008; Tykot 2004). The two dominant photosynthetic pathways, C3 and C4 (after the number of carbon atoms fixed in the initial product), result in different ratios of the two stable isotopes of carbon,  $^{12}\text{C}$  and  $^{13}\text{C}$ .

The C3 pathway is typically followed by trees, woody shrubs, herbs and grasses from temperate regions. Domesticated C3 cereals include rice, wheat, barley, and oats while C3 root staples include manioc, yam and potato. The isotope ratio values ( $\delta^{13}\text{C}$ ) for C3 plants average about  $-26.5\text{‰}$  but range from  $-24\text{‰}$  to  $-36\text{‰}$  (Lee-Thorp 2008; Tykot 2004). The C4 pathway is commonly utilised by grasses native to hot and arid environments as well as by some sedges. Domesticated C4 plants include maize, sorghum, millet and cane sugar. C4 plant  $\delta^{13}\text{C}$  values average about  $-12.5\text{‰}$  and their range is narrower, between  $-7\text{‰}$  and  $-16\text{‰}$  (Krigbaum 2005; Lee-Thorp 2008; Tykot 2004). The carbon isotope ratios of marine organisms vary depending on their local ecology, but primary producers such as algae and diatoms are usually enriched in  $^{13}\text{C}$  compared to those in terrestrial C3 ecosystems (Lee-Thorp 2008; Tykot 2004), resulting in marine organisms with  $\delta^{13}\text{C}$  values around  $-12\text{‰}$  (Collier and Hobson 1987). While purely marine-food consumers should contrast to those on a terrestrial C3 diet, the difference between marine-food consumers and those on a terrestrial C4 diet is more difficult to distinguish. We are primarily interested in distinguishing the origin of samples rather than determining their diet, so we will focus on differences among groups rather than on assessing dietary components.

## Sites and Materials

### Anuru Bay A

In the soft sand of the beach dune at the Macassan Anuru Bay A site, about 15m behind the high water mark, two burials were identified and excavated by Macknight in 1966 (Macknight 1976; Macknight and Thorne 1968). Digging underneath a 'rather jumbled spread of stones that had probably once been a rectangular outline' (1976:68), two individuals, buried at different times, were uncovered. A summary of Macknight's (1976) and Macknight and Thorne's (1968) observations and interpretations follows: The first burial (MAC I) consisted of a

relatively wide shallow grave into which a person had been laid face downwards, with the head at the northern end. Macknight and Thorne assessed the skeleton as male, 170cm tall and about 32 years old. He had lost 10 teeth over the previous years and the remaining teeth were in poor condition. Probably some years later, a second burial pit was excavated at right angles to the previous trench, cutting across the centre of the first body. The bones from the neck to the knees of the first body were put aside and a second man was laid on his right side with his head to the east. A row of stones was laid behind him. The second person (MAC II) was male, around 160cm tall and died in his early 20s. He had lost only one tooth previously but had chronic gum disease. As the second burial was filled in, the bones of the first burial were heaped into the north side of the trench, in approximately the area from which they had been removed. The cause of death for both men is unknown.

In addition to their proximity to a trepanning processing site, Macknight and Thorne viewed several other details as evidence for their final conclusion that the buried individuals were Macassan men. The graves were marked by a rectangle of stones, a feature of Macassan graves in Australia also observed on Winchelsea Island. The second burial had been arranged in Muslim practice, with the body on its right side facing west towards Mecca. Thick deposits of limy calculus around the teeth of both men and black staining of the second man's mouth suggest they chewed lime and betel. Both men also had their teeth filed down, a common custom in the Indonesian archipelago including South Sulawesi.

Today, the skeletal remains of the two men are held by the J.L. Shellshear Museum of Physical Anthropology and Comparative Anatomy at the University of Sydney. For this project, one mandibular premolar was obtained from each skeleton (Table 1).

### Malarakk

The teeth used as a local Arnhem Land signature in this study came from two rockshelters excavated by a team led by Daryl Wesley and Sue O'Connor at the Indigenous Malarakk Complex in 2008. Analyses were carried out with prior permission from coauthor RL, senior traditional owner of the lands of the Manganowal traditional owners within the Arnhem Land Aboriginal Land Trust. All Malarakk samples remain the property of the traditional owners. All teeth were isolated finds with no other human skeletal material nearby. The main Malarakk shelter revealed two teeth. A human molar, MG25, was uncovered around 150mm beneath the surface of test pit G25 within a

**Table 1** Origin, type and condition of samples.

Sample	Location	Type	Condition
MAC I	Anuru Bay A, Burial I	Human premolar (mandibular)	No wear
MAC II	Anuru Bay A, Burial II	Human premolar (mandibular)	No wear
MG25	Malarakk Main Shelter, Square G25, XU8	Human molar (mandibular)	Heavily worn to dentine; 2 cavities on sides (one deep, one developing)
MK25	Malarakk Main Shelter, Square K25, XU4	Faunal mandible fragment (3 teeth)	
MT4	Malarakk Shelter #4, Trench 1, Square 11, XU4	Human premolar	No wear; one lateral crack
MT6	Malarakk Shelter #4, Trench 1, Square 11, XU6	Human molar	Slightly worn; split laterally; several hairline cracks

hearth-like lens of dense charcoal surrounded by loose sandy sediment (Table 1). A radiocarbon date of  $487 \pm 26$  BP (NZA-32470) was obtained around 50mm above the excavation unit containing MG25 and a date of  $577 \pm 17$  BP (NZA-32455) was obtained around 50mm below the unit. An iron spearhead was excavated just below the excavation unit. The test pit stratigraphy appeared disturbed with possible postholes penetrating from the upper sediment into the Pleistocene sediment starting 350mm below the surface.

A mandible fragment with several teeth of a small mammal, MK25, was recovered from test pit K25, also in the main Malarrak shelter. Located around 80mm beneath the surface in loose sediment, the mandible may have belonged to a possum or rat-kangaroo. No dating information is available for test pit K25.

In Malarrak Rockshelter #4, one test pit was excavated revealing two additional teeth. MT4, a human premolar, was found approximately 80mm beneath the surface in sandy sediment containing large concentrations of charcoal thought to belong to hearth remains. The second tooth in this test pit, human molar MT6, was uncovered approximately 40mm below MT4, also in sandy sediment with dense charcoal concentrations. A fragment of Staffordshire Ware ceramic, possibly from the late eighteenth to early nineteenth century, was found in the excavation unit containing MT4, and a glass fragment was found in the excavation unit containing MT6. This shelter appeared to have well-preserved stratigraphy, suggesting deposition of the teeth occurred within the European contact period.

## Methods

Enamel was collected and pretreated to remove adhering contaminants following procedures adapted from Koch *et al.* (1998) and detailed in Fenner (2007:175–178). Briefly, teeth were mechanically cleaned and enamel powder collected using a drill. Samples were immersed in 2% NaOCl for 24 hours, rinsed, then immersed in 0.1N  $C_2H_5O$  for four hours. Strontium isotope composition was determined by Geochron Laboratories, Massachusetts using TIMS. NIST 987 standard samples run simultaneously produced a value of  $0.710240 \pm 0.000012$  (2 $\sigma$  error). Oxygen and carbon isotope in enamel carbonate was determined at the Australian National University Research School of Earth Sciences on a Finnigan MAT 251 IRMS. Sample MAC I did not contain quite enough enamel to balance against the reference gas during the measurement, but the laboratory is confident the result is accurate. Results are reported using the VPDB standard. When compared with precipitation,  $\delta^{18}O$  values are converted to the SMOW standard and adjusted for fractionation during incorporation into enamel apatite using the equations in Coplen *et al.* (1983), Bryant *et al.* (1996:5147) and Daux *et al.* (2008).

Due to low sample size, all statistical tests were performed using the unequal variance *t*-test (Ruxton 2006). A metric analysis of Anuru Bay A skull morphology for geographic assignment using the FORDISC and CRANID tools was performed but results were inconclusive (Watson 2011). Both programmes were unable to confidently assign the skulls to any group, presumably due to the lack of Indonesian data in the FORDISC and CRANID comparative database. Radiocarbon dating was performed on enamel from each Anuru Bay A sample using AMS at the Australian National University Radiocarbon Dating Laboratory.

## Results

Stable isotope ratio analysis results are shown in Table 2 and Figure 2. The strontium isotope data show a large range and clear grouping. The Anuru Bay A and Malarrak samples are significantly different ( $t=10.970$ ,  $p=0.007$ ,  $df=2.106$ ), with the Anuru Bay A samples much lower than the Malarrak samples. Within each location, there is substantial strontium isotope variation: 0.0018 for the two samples from Anuru Bay A and 0.0031 for the four samples from Malarrak. Excluding the faunal sample as potentially reflecting a different geographic range from the human samples, the Malarrak samples still have a fairly large strontium isotope range of 0.0012.

The  $\delta^{18}O$  values range from  $-5.91\text{‰}$  to  $-0.42\text{‰}$ . Daux *et al.* (2008:1144–1145) suggest that 'at any given place, the water ingested by human beings via solid foods, whether it is raw or cooked, should not be richer in  $^{18}O$  than is the total water ingested by herbivorous animals of the same place whose diet is composed of raw plants (tree-leaves, fruits, and grass)'. The faunal sample in this study, MK25, is indeed an outlier in the sample set, with an isotopic value far more enriched than the human samples and also well outside the expected range of modern Arnhem Land precipitation  $\delta^{18}O$  values (discussed below). It may be that this animal obtained most of its water from different sources than did the humans; it may have used water derived from plants rather than drinking water, or sipped water from partially evaporated puddles. To avoid distortion of comparative human enamel results the oxygen isotope signature of MK25 is excluded in the statistical analyses. We note however that including the faunal sample in the Malarrak values does not materially alter the results (data not shown).

Excluding the faunal sample, the Anuru Bay A and Malarrak  $\delta^{18}O$  values are not significantly different ( $t=0.085$ ,  $p=0.943$ ,  $df=1.441$ ). Figure 2 shows that in fact the two Anuru Bay oxygen isotope values are at opposite extremes of the total human range, while the Malarrak values are spaced (widely) in between.

As with  $\delta^{18}O$ , the faunal sample is omitted from  $\delta^{13}C$  statistical comparisons with human samples because its diet is probably different from a human diet in the same region. The Anuru Bay A samples are on average 0.9‰ more positive than the Malarrak human samples (Table 2, Figure 2). A ranked *t*-test indicates the two populations are statistically different ( $t=3.536$ ,  $p=0.046$ ,  $df=2.667$ ) while an unranked test does not reach statistical significance ( $t=4.110$ ,  $p=0.1425$ ,  $df=1.056$ ). This uncertainty is likely to be a reflection of the small sample size.

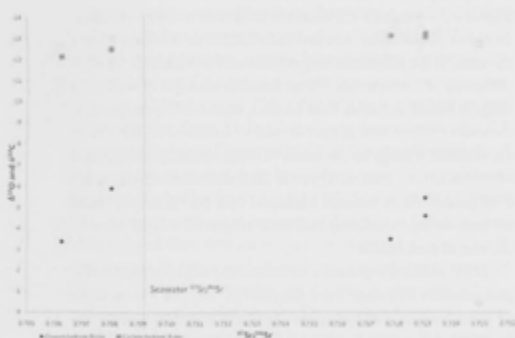
Interestingly, the human  $\delta^{13}C$  values are strongly linearly correlated with the  $^{87}Sr/^{86}Sr$  values (two-tailed  $r=-0.98$ ,  $p=0.004$ ; Spearman's  $\rho=-0.98$ ,  $p=0.005$ ). This suggests the  $\delta^{13}C$  values at the base of food chains vary systematically with geographical variation evident in the strontium data. While this could reflect either causal or coincidental geological interaction with plant communities such that plants growing on older rocks tend to be depleted in heavy carbon isotopes, it seems more likely to involve human dietary behaviour. Perhaps younger geology with low strontium isotope ratio values tends to be located closer to the sea, and people living closer to the sea eat more marine food with relatively low  $\delta^{13}C$  values. A larger sample will be needed to test this hypothesis.

**Table 2** Strontium, oxygen and carbon isotope ratio results. Note:  $\delta^{18}\text{O}_{\text{SW}}$  is the estimated isotope ratio of source water calculated from  $\delta^{18}\text{O}$  using equations in Coplen et al. (1983), Bryant et al. (1996:5147) and Daux et al. (2008).  $\delta^{18}\text{O}_{\text{SW}}$  uses the VSMOW standard;  $\delta^{18}\text{O}$  and  $\delta^{13}\text{C}$  use the VPDB standard.

Sample	Site	Type	Lab. No.	Strontium		Oxygen (%)		Carbon (%)
				$^{87}\text{Sr}/^{86}\text{Sr}$	2 $\sigma$ error	$\delta^{18}\text{O}$	$\delta^{18}\text{O}_{\text{SW}}$	$\delta^{13}\text{C}$
MAC I	Anuru Bay A	Human	SS-119887	0.70628	0.000007	-3.4	-4.8	-12.1
MAC II	Anuru Bay A	Human	SS-119888	0.70807	0.000008	-5.9	-8.8	-12.5
	Anuru Bay A mean values			0.70718		-4.7	-6.8	-12.3
MG25	Malarrak Main	Human	SS-119890	0.71786	0.000011	-3.5	-5.0	-13.1
MK25	Malarrak Main	Faunal	SS-119889	0.72097	0.000009	-0.4	-0.2	-12.7
MT4	Malarrak #4	Human	SS-119891	0.71910	0.000012	-4.6	-6.7	-13.2
MT6	Malarrak #4	Human	SS-119892	0.71909	0.000012	-5.5	-8.1	-13.1
	Malarrak mean values			0.71926		-3.5	-5.0	-13.0

**Table 3** Enamel radiocarbon dates. Dates calibrated using the SHCAL04 curve (McCormac et al. 2004) in the BCal tool (Buck et al. 1999). The  $\delta^{13}\text{C}$  values are due to fractionation occurring in the ion source and are not directly comparable to apatite values.

Sample	Lab. No.	$\delta^{13}\text{C}_{\text{‰}}$	$^{14}\text{C}$ Age (years BP)	Calibrated Age (cal years AD)
MAC I	ANU-19410	-11.3	295 $\pm$ 50	1496 to 1691, 1727 to 1804
MAC II	ANU-19411	-12.4	255 $\pm$ 55	1505 to 1594, 1615 to 1710, 1718 to 1811



**Figure 2** Strontium, oxygen and carbon isotope ratios. Also shown is the strontium isotope value of modern seawater (0.70921). Samples left of the seawater line are from Anuru Bay A; those to the right are from Malarrak. Filled markers are human samples; outlined markers are from the faunal sample.

## Radiocarbon Results

As is common for radiocarbon dates from after AD 1500, the Anuru Bay A calibrated dates span a fairly long timeframe (Table 3). The posterior probability distributions are uneven, however, and tend to be weighted towards the earlier dates within the range. MAC I, for instance, has a 72% chance of being earlier than AD 1700 and only a 12% chance of being later than AD 1770. Enamel does not remodel during life so the radiocarbon method dates when the enamel formed, rather than when the person died. Human adult premolar enamel forms between ages 2 and 8 (Bass 1995:304). Macknight and Thorne (1968:219) estimate that MAC I was in his early 30s when he died so the radiocarbon-based dates pre-date the burial by 20 to 30 years. Thus MAC I most likely died in the first half of the eighteenth century. MAC II has a 40% chance of being earlier than AD 1700 and a 13% chance of being later than AD 1780.

MAC II was assessed as being in his early 20s (1968:220) so the radiocarbon dates for that skeleton pre-date the burial by 10 to 20 years, and MAC II most probably died in the mid-to-late eighteenth century.

The archaeological context of the burials indicates the MAC II burial disturbed the MAC I burial and therefore occurred later in time than MAC I (Macknight and Thorne 1968:218). Incorporating this information into the date calibration (and ignoring for the moment the 10-year difference in age at death) increases the probability that MAC I was earlier than AD 1700 to 84%. Adding in his age at death, there is thus an 84% chance that he died (and Anuru Bay A was occupied) before approximately AD 1730.

## Discussion

### Strontium Isotopes

The strontium and carbon isotope results indicate the Anuru Bay A and Malarrak samples have significantly different means and thus probably come from different populations. The next task is to determine which (if any) of the two populations is the local group. The archaeological evidence strongly links the Anuru Bay A skeletons to a Macassan site, placing them as the best candidates for non-local people. Meanwhile, the Malarrak remains are associated with an Aboriginal Australian rockshelter and are therefore likely to be representative of a local population. We can evaluate this proposition using only isotopic data. First, our one small mammal sample would be considered *a priori* as the most likely 'local' candidate. Its strontium isotope value exceeds but is close to the human Malarrak samples, and greatly exceeds the Anuru Bay A samples. This points to the Malarrak humans being the local population.

We can also compare our results to geological strontium isotope data. As noted above, geological strontium values can vary substantially from biologically available strontium values, but can provide a rough gauge of likely values within a region.

Geological strontium isotope ratios from around the Australia and Island Southeast Asia region are shown in Table S1. It is clear from these data that Australian values are generally high (exceeding 0.710) while Island Southeast Asian values are relatively low (usually below seawater's value of 0.709). This is as expected because Australia in general and Arnhem Land in particular are known to have very old rock formations while Island Southeast Asia is largely of relatively recent volcanic or sedimentary origin. Our Malarrak samples have values exceeding 0.710 while the Anuru Bay A samples are below 0.709; this once again points to the Malarrak samples as the local population and the Anuru Bay samples as the non-local population. In sum, between the isotopic data and the archaeological contexts, there is no reasonable doubt the Anuru Bay A remains are from Macassans and the Malarrak remains are from Australian Aboriginal people.

The strontium variation within each group is also interesting. The two samples from Malarrak Shelter #4, MT4 and MT6, have almost identical strontium signatures. MG25 differs by about 0.0012, still within one standard deviation from MT4 and MT6. Given the likely variation of geological strontium isotope values in the area (Table S1), this difference could simply be the result of an individual obtaining his or her nutrients from a slightly different resource composition or location. The lower signature of MG25 could, for example, reflect an increased exploitation of estuarine or marine resources. The Malarrak teeth are all quite recent, probably less than 500 years old, but even so, the difference between them may also reflect a shift in resource use over time. A larger human and/or faunal sample size from northwest Arnhem Land would allow for more certain interpretations of any variation within the data.

While the two Anuru Bay A samples are quite convincingly non-local, their actual origin is unclear. MAC I and MAC II did not necessarily share a common childhood origin, with their signatures differing by 0.0018. This range is surprisingly large for only two samples, and suggests they did not grow up on the same geologic substrate. Of course, the complex geologically-derived  $^{87}\text{Sr}/^{86}\text{Sr}$  values of Indonesia caution that the difference in  $^{87}\text{Sr}/^{86}\text{Sr}$  values between MAC I and MAC II do not necessarily exclude a common place of origin either. Differences may be accounted for by variations of resource use, higher values for example being obtained by farming on limestone lowlands common on islands and lower values obtained through acquisition of resources from young volcanic soils. Both extremes of the geological strontium isotope range found in Indonesia occur on Sulawesi alone, the most likely place of origin of the Macassans based on historical information. The lower signature of MAC I, for example, could indicate a childhood predominantly located on young volcanic rocks, while the higher signature of MAC II could indicate influencing factors such as marine and coastal resources.

It is unlikely the homeland of the Macassan men can be determined with certainty based on isotope analysis alone. With comparative biological samples from various possible locations in Indonesia, however, it may become possible to exclude certain places and thus narrow down the number of potential places of origin. Incorporation of other geologically-determined isotope ratios, such as those of lead, could also help narrow the number of potential homelands.

## Oxygen Isotopes

The relationship between oxygen isotope ratios in modern meteoric precipitation and latitude and altitude has been globally modelled based on information from the International Energy Association/World Meteorological Organization Global Network of Isotopes in Precipitation. Estimates of  $\delta^{18}\text{O}$  in various locations are provided according to an algorithm developed by Bowen and Wilkinson (2002) (and refined by Bowen and Revenaugh 2003 and Bowen *et al.* 2005) called the Online Isotopes in Precipitation Calculator (OIPC version 2.2). According to this online calculator, Darwin and most of the Northern Territory sit in an area with  $\delta^{18}\text{O}$  precipitation values expected around -5 to -5.9‰, while most of Indonesia expects values from -4 to -9.9‰.

A specific query considering latitude, longitude and altitude, provides an estimated  $\delta^{18}\text{O}$  precipitation value of -5.2‰ for Anuru Bay at sea-level, an estimate of -5.3‰ at 100m elevation approximately 50km inland (directly south) from Anuru Bay, and an estimate of -5.8‰ at 350m elevation approximately 150km inland (directly south) from Anuru Bay.

Precipitation estimates vary further in the more mountainous island environments of Indonesia. For example, an estimated  $\delta^{18}\text{O}$  precipitation of -5.6‰ at sea-level for Makassar on Sulawesi decreases to -6.7‰ as the land rises to 300m elevation southeast of Makassar, and decreases further to -8.1‰ at 1200m elevation in the mountain ranges 50km east of Makassar. This is a difference of 2.5‰ within 50km. Another example of wide  $\delta^{18}\text{O}$  range is found in Papua New Guinea, where  $\delta^{18}\text{O}$  precipitation increases from -7.4‰ at Port Moresby (sea-level) to -12.7‰ in the mountain range to the north (2700m altitude), a difference of 5.3‰ within 150km. There is little difference in estimated  $\delta^{18}\text{O}$  precipitation between Makassar and Port Moresby (both on west-facing coastlines) and their respective coastal sites on the east of each island.

These predictive patterns are consistent with the model that precipitation becomes more depleted of heavier  $^{18}\text{O}$  isotopes as water vapour moves farther from the ocean and elevation increases. As oxygen isotopes in the human body are primarily derived from ingested drinking water (Eckardt *et al.* 2009), an isotopic similarity between the oxygen isotopes in the human body and those in local meteoric water exists, especially in archaeological populations where water would have been sourced locally and consumption of imported drink and foodstuffs was limited (Pye 2004).

A complicating factor is that both Australia's north coast and Indonesia are in the tropics within the Indo-Australian monsoon region, characterised by high temperatures, high humidity and abundant rain (van Bemmelen 1949). This may reduce the potential for applying oxygen isotope forensics, as the most distinct results are obtained in mid- to high-latitude continental regions where strong spatial isotope gradients exist (Bowen *et al.* 2005). Furthermore, comparing precipitation  $\delta^{18}\text{O}$  data with  $\delta^{18}\text{O}$  recovered from human remains rests on the assumption that  $\delta^{18}\text{O}$  of ingested water is relatively unaltered from its source precipitation. Shallow groundwater often has a close association with precipitation, unless evaporation has enriched water through loss of lighter isotopes (Pye 2004). Conversely, deep groundwater and surface waters fed from artesian sources may be different from modern precipitation values because of water-rock

interaction and the effects of climatic change (Pye 2004). River water, too, could introduce a precipitation value representative of an area upstream. Thus, by the time it is ingested, drinking water can be quite different from mean  $\delta^{18}\text{O}$  of rainfall. We suggest this explains the non-patterned but large  $\delta^{18}\text{O}$  variation found in our samples. Daux *et al.* (2008:1146) indicate that ideally, confidence in the validity of the interpretation can only be obtained through a 'full understanding of the hydrological factors at the local scale', which is currently unavailable for both Arnhem Land and Indonesia.

### Carbon Isotopes

As previously discussed, the carbon isotope ratios provide weak support for a difference between the Anuru Bay and Malarrak human samples, with one statistical test achieving significance while another does not. This uncertainty is probably a result of the small sample size. It is interesting, however, that all samples (including the faunal sample) fall in a small range between -12.1 and -13.2‰. Given a diet-to-enamel offset of at least 9‰ (Tykot *et al.* 2009), all samples represent diets below -21‰ and therefore show strong C3 signatures. The Macassans probably had a rice-dominated diet (Macknight 1976) so a C3 signature would be expected for them. The past Indigenous Australian diet within Arnhem Land is more difficult to characterise. Grasses within Arnhem Land are predominantly C4 (Hattersley 1983) and seven modern *Macropus* samples from southeast Arnhem Land showed substantial C4 influence with enamel values averaging  $-7.5 \pm 1.2$ ‰ (Murphy *et al.* 2007). Nevertheless, our human and faunal samples from Malarrak indicate a predominantly C3-based terrestrial diet. This suggests either that people emphasised non-grass based resources such as tubers, nuts, fruits and forest mammals (including the small mammal in our faunal sample) or that C3 grasses were more common at that time in northernmost Arnhem Land than they are today in southeast Arnhem Land. It also appears that marine fish and mammals did not comprise a large portion of the diet during childhood when enamel was forming. A larger archaeological human and faunal sample which includes collagen-based isotope analyses will be needed to investigate this further.

### A British Origin?

Given the fairly wide range of calibrated radiocarbon dates and the presence of European artefacts within the apparently disturbed contexts of the Malarrak units, it is possible that our human samples are neither locals nor neighbours; they could potentially be from Britain. The strontium isotope ratios of the Malarrak individuals, however, are strongly suggestive of the diverse geological range of the greater Arnhem Land region, exceed the range found in the British Isles other than in several small Scottish regions (Evans *et al.* 2010), and are compatible with the presumably local small mammal faunal sample. Additionally, the remote location of the Malarrak shelter and its significance as an important Indigenous site render it unlikely the samples derive from non-Indigenous individuals.

A European origin for the Anuru Bay individuals can be dismissed based on the archaeological and morphological evidence. Tooth filing on both men, teeth stained by lime and betel, and Muslim burial practices are indicative of a southeast Asian, rather than a European, origin.

### Conclusions

Stable isotope ratio data obtained from human tooth enamel at two sites in northwest Arnhem Land – Anuru Bay A and Malarrak – support three main points. The first is that each site clearly represents a distinct population in terms of childhood origin. The second is that geologic strontium information combined with a faunal sample can be successfully used to distinguish the non-local (Anuru Bay A) from the local (Malarrak) population. These two points support the archaeological and ethnographic evidence for both sites, confirming one as a Macassan burial site and the other as an Indigenous site. Furthermore, our radiocarbon data indicate that Anuru Bay A was a relatively early Macassan site, with at least one of its occupations probably occurring before AD 1730.

The third point is that there is potential in the isotope data to identify trends on an individual scale, especially through the combined patterns revealed by the strontium and carbon isotope analyses. So while the current data are insufficient to determine the precise origins of the Macassan men, for example, they do reveal subtle information pertaining to the men's origins, such as the unlikelihood they spent their childhoods in the same area. Similarly, the large variation within the data suggests that all the Indigenous individuals from Malarrak may not have originated in the same locality either.

With strong results regarding provenance obtained even from a very small sample set – five humans and one small mammal – our study shows potential for further isotope research in north Australian archaeology. With a larger sample size, for example, a dataset could be built from which to define a local population more accurately and in which to firmly position the current findings. In particular, a large sample of biogenic strontium isotope ratios from various locations in Arnhem Land and at potential places of Macassan origin in Indonesia would reduce uncertainty surrounding the origin of these individuals as well as others who may be studied in the future. The substantial strontium isotope ratio variation predicted by the geology of Arnhem Land and confirmed in our small sample from Malarrak promises to be of great use in studies of pre-European Aboriginal Australian movement and may also assist in resolving issues of repatriation or geographic association of human skeletal material.

### Supplementary Information

Supplementary information for this article is available online at [www.australianarchaeologicalassociation.com.au](http://www.australianarchaeologicalassociation.com.au).

### Acknowledgements

We would like to thank Denise Donlan and the J.L. Shellshear Museum of Physical Anthropology and Comparative Anatomy at the University of Sydney for allowing us to take samples from the Anuru Bay teeth. Thanks also to Lindsay Watson for performing the metric analysis of the Anuru Bay skulls and creating casts of the Anuru Bay teeth, and to Marc Oxenham for helping with cast creation. Funding for this project was provided by ARC Linkage Project Baijini, Macassans, Balanda, and Bini: Defining the Indigenous past of Arnhem Land through Culture Contact awarded to Daryl Wesley and Sue O'Connor.

## References

- Bass, W.M. 1995 *Human Osteology: A Laboratory and Field Manual*. Columbia: Missouri Archaeological Society.
- Bentley, R.A. 2006 Strontium isotopes from the earth to the archaeological skeleton: A review. *Journal of Archaeological Method and Theory* 13(3):135-187.
- Bentley, R.A., H.R. Buckley, M. Spriggs, S. Bedford, C.J. Orley, G.M. Nowell, C.G. Macpherson and D.G. Pearson 2007 Lapita migrants in the Pacific's oldest cemetery: Isotopic analysis at Teouma, Vanuatu. *American Antiquity* 72(4):645-656.
- Bentley, R.A., T.D. Price and E. Stephan 2004 Determining the 'local'  $^{87}\text{Sr}/^{86}\text{Sr}$  range for archaeological skeletons: A case study from Neolithic Europe. *Journal of Archaeological Science* 31:365-375.
- Bernhardt, R.M. and C.H. Bernhardt 1947 Discovery of pottery in north-eastern Arnhem Land. *The Journal of the Royal Institute of Great Britain and Ireland* 77(2):133-138.
- Bowen, G.J. and J. Revengaugh 2003 Interpolating the isotopic composition of modern meteoric precipitation. *Water Resources Research* 39(10):1299.
- Bowen, G.J., L.I. Wassenaar and K.A. Hobson 2005 Global application of stable hydrogen and oxygen isotopes to wildlife forensics. *Oecologia* 143:337-348.
- Bowen, G.J. and B. Wilkinson 2002 Spatial distribution of  $^{18}\text{O}$  in meteoric precipitation. *Geology* 30(4):315-318.
- Bryant, J.D., P.L. Koch, P.N. Froelich, W.J. Showers and B.J. Genna 1996 Oxygen isotope partitioning between phosphate and carbonate in mammalian apatite. *Geochimica et Cosmochimica Acta* 60(25):5145-5148.
- Buck, C.E., J. Christen and G.N. James 1999 BCal: An online Bayesian radiocarbon calibration tool. *Internet Archaeology* 7.
- Collier, S. and K.A. Hobson 1987 The importance of marine protein in the diet of coastal Australian Aborigines. *Current Anthropology* 28(4):559-564.
- Coplen, T.B., C. Kendall and J. Hoppfe 1983 Comparison of stable isotope reference samples. *Nature* 302:236-238.
- Daux, V., C. Lécuyer, M. Hérin, R. Amiot, L. Simon, F. Fouré, F. Martineau, N. Lynnerup, H. Reyher and G. Escarguel 2008 Oxygen isotope fractionation between human phosphate and water revisited. *Journal of Human Evolution* 55(6):1138-1147.
- Eckardt, H., C. Chenery, P. Booth, J.A. Evans, A. Lamb and G. Müldner 2009 Oxygen and strontium isotope evidence for mobility in Roman Winchester. *Journal of Archaeological Science* 36(12):2816-2825.
- Evans, J.A., J. Montgomery, G. Wildman, and N. Boulton 2010 Spatial variations in biosphere  $^{87}\text{Sr}/^{86}\text{Sr}$  in Britain. *Journal of the Geological Society* 167(1):1-4.
- Fenner, J.N. 2007 Prehistoric Hunting on the Range where the Antelope Play: Archaeological Pronghorn Bonebed Formation Analysis. Unpublished PhD thesis, Department of Anthropology, University of Wyoming.
- Hattersley, P.W. 1983 The distribution of C3 and C4 grasses in Australia in relation to climate. *Oecologia* 57:113-128.
- Koch, P.L., K.A. Hoppfe and S.D. Webb 1998 The isotopic ecology of late Pleistocene mammals in North America: Part 1. Florida. *Chemical Geology* 152:119-138.
- Krighbaum, J. 2005 Reconstructing human subsistence in the West Mouth (Niah Cave, Sarawak) burial sites using stable isotopes of carbon. *Asian Perspectives* 44:73-89.
- Lee-Thorp, J.A. 2008 On isotopes and old bones. *Archaeometry* 50:925-950.
- Luz, B., Y. Kolodny and M. Horowitz 1984 Fractionation of oxygen isotopes between mammalian bone-phosphate and environmental drinking water. *Geochimica et Cosmochimica Acta* 48:1689-1693.
- Macknight, C.C. 1976 *The Voyage to Marege: Macassan Trepangers in Northern Australia*. Melbourne: Melbourne University Press.
- Macknight, C.C. 2008 Harvesting the memory: Open beaches in Makassar and Arnhem Land. In P. Veth, P. Sutton and M. Neale (eds), *Strangers on the Shore: Early Coastal Contacts in Australia*, pp.133-147. Canberra: National Museum of Australia Press.
- Macknight, C.C. and A.G. Thorne 1968 Two Macassan burials in Arnhem Land. *Archaeology and Physical Anthropology in Oceania* 3(3):216-222.
- McCormac, F.G., A.G. Hogg, P.G. Blackwell, C.E. Buck, T.E.G. Higham and P.J. Reimer 2004 SHCal04 Southern Hemisphere calibration, 0-11.0 cal kyr BP. *Radiocarbon* 46:1087-1092.
- Murphy, B.P., D.M.J.S. Bowman and M.K. Gagan 2007 Sources of carbon isotope variation in kangaroo bone collagen and tooth enamel. *Geochimica et Cosmochimica Acta* 71:3847-3858.
- Price, T.D., J.H. Burton and R.A. Bentley 2002 The characterization of biologically available strontium isotope ratios for the study of prehistoric migration. *Archaeometry* 44(1):117-135.
- Pye, K. 2004 Isotope and trace element analysis of human teeth and bones for forensic purposes. In K. Pye and D.J. Croft (eds), *Forensic Geoscience: Principles, Techniques and Applications*, pp.215-236. Special Publications 232. London: Geological Society.
- Raxson, G.D. 2006 The unequal variance t-test is an underused alternative to Student's t-test and the Mann-Whitney U test. *Behavioral Ecology* 17:699-690.
- Shaw, B.J., H. Buckley, G.R. Summerhayes, D. Anson, S. Garling, E. Valentin, H. Mandui, C. Stirling and M. Reid 2010 Migration and mobility at the Late Lapita site of Reber-Rakival (SAC), Watom Island using isotope and trace element analysis: A new insight into Lapita interaction in the Bismarck Archipelago. *Journal of Archaeological Science* 37(3):605-613.
- Shaw, B.J., G.R. Summerhayes, H.R. Buckley and J.A. Baker 2009 The use of strontium isotopes as an indicator of migration in human and pig Lapita populations in the Bismarck Archipelago, Papua New Guinea. *Journal of Archaeological Science* 36:1079-1091.
- Taçon, P.S.C., S.K. Maj, S.J. Fallon, M. Travers, D. Wesley and R. Lamilami 2010 A minimum age for early depictions of Southeast Asian praus in the rock art of Arnhem Land, Northern Territory. *Australian Archaeology* 71:1-10.
- Tykot, R.H. 2004 Stable isotopes and diet: You are what you eat. In *Physics Methods in Archaeometry: Proceedings of the International School of Physics* 114:433-444. Amsterdam: IOS Press.
- Tykot, R.H., E. Falabella, M.T. Planella, E. Aspíllaga, L. Sanhueza and C. Becker 2009 Stable isotopes and archaeology in central Chile: Methodological problems for dietary reconstruction. *Journal of Osteoarchaeology* 19:156-170.
- Valentine, B., G.D. Kamenov and J. Krighbaum 2008 Reconstructing Neolithic groups in Sarawak, Malaysia through lead and strontium isotope analysis. *Journal of Archaeological Science* 35:1463-1473.
- Van Bemmelen, R.W. 1949 *The Geology of Indonesia, Vol. 1A General Geology*. The Hague: Government Printing Office.
- Warner, W.L. 1932 Malay influence on the Aboriginal culture of northeastern Arnhem Land. *Oceania* 20:476-495.
- Watson, L. 2011 Ancestral Analysis of Two Crania from the Shellshear Museum. Unpublished report to School of Anthropology and Archaeology, The Australian National University.